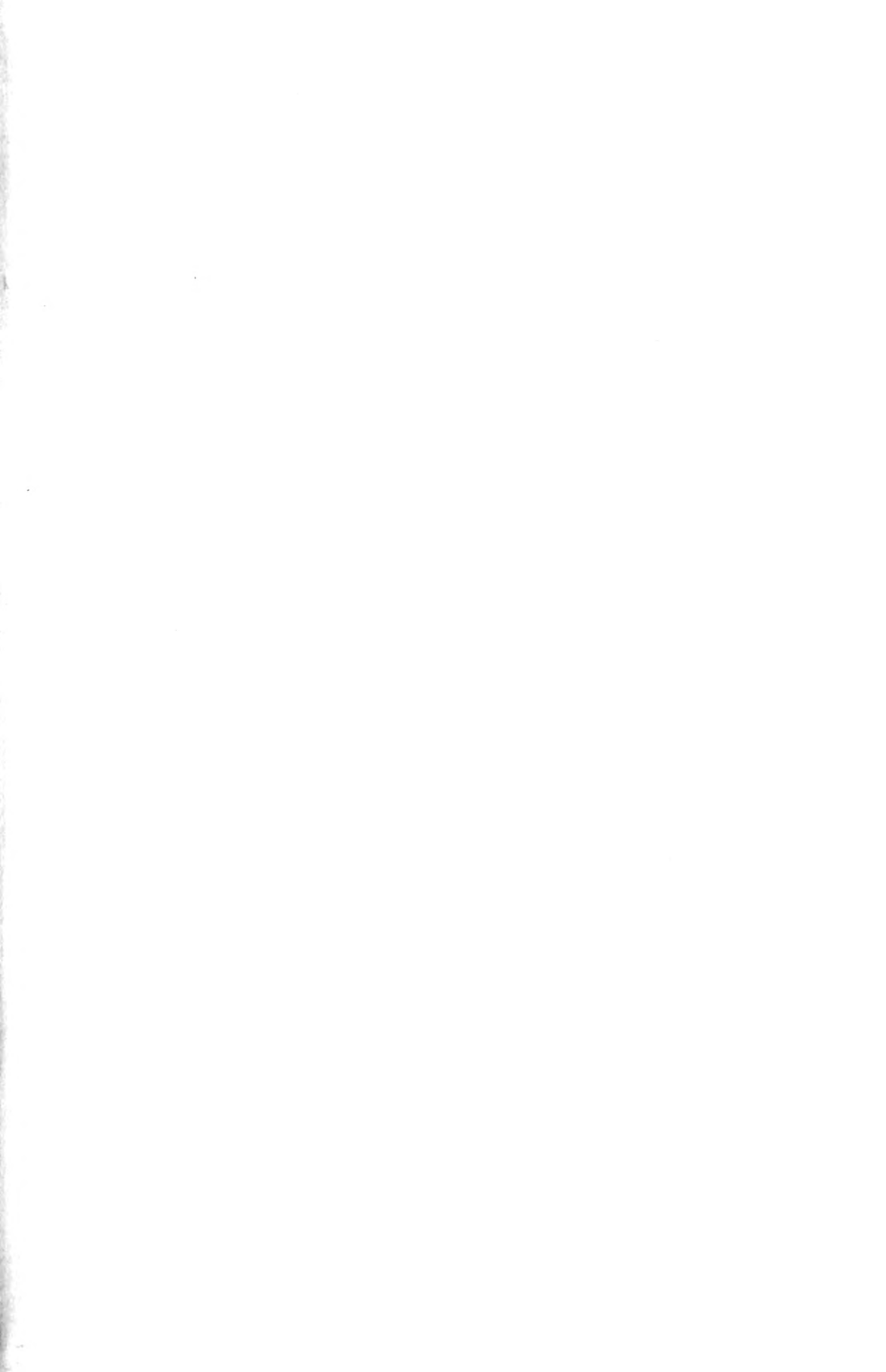


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LECTURE GIVEN AT THE ARMY SANITARY SCHOOL,
A. E. F.

BY MAJOR FERNAUD LEMAITRE
Medical Corps, French Army
[Translation]

I HAVE practiced primary suture of war wounds since the month of July, 1915. After 29 months' experience it seems interesting to publish the results I have obtained, the reasons that led me to treat war wounds in this fashion, and the technique I have used. Having had the advantage of working in an army ambulance immobilized in a large hospital center, the activity of which in a majority of cases allowed me to keep the wounded until recovery—later on in a more active center, with a capacity allowing retention of the patient for a prolonged period—I can give these results as definite for the majority of the cases I have treated. Almost all outside of fracture cases, joined their regiment directly after leaving the hospital, from fifteen days to two months after operation and having a leave of absence varying from fifteen days to three months. During this time 2,283 wounded were treated within twenty-four hours after their injury, 1,862 between the seventh hour and the fifteenth, 295 before the seventh hour, and 126 after the fifteenth following the injury.

I believe it to be preferable in any large number of cases, and with multiple wounds, to speak of wounds rather than of wounded. Each one can be considered from the point of view of treatment and evolution as though it were unique. I shall, therefore, speak, of wounds and not of wounded. These 2,283 wounded presented 4,227 wounds. Amongst these wounds 323 were not treated surgically on account of their small size (very small fragments, especially in the face, perforating rifle bullet wounds with entrance and exit—openings equally small, without fracture, without injury to the blood vessels or the nerves and without any sign of infection). *Three thousand, nine hundred and four wounds were treated surgically, 2,537 of these were united by primary suture, and 307 by secondary suture.* Eight hundred and fifty-one wounds were not sutured at all, because the wounds closed progressively

of themselves, or the wounded died, or, finally, because in a period of great activity wounded had to be evacuated too soon to be sutured. In our statistics I will only consider 2,537 primary sutures and will leave aside 209 delayed primary sutures and 307 secondary sutures; also 851 wounds which were not sutured at all.

WOUNDS OF THE SOFT PARTS

1. Wounds of the soft parts of medium importance..... 718
3 total failures and 8 partial failures.

NOTE.—Understand by complete failures, cases where it was necessary to remove all the stitches; and by partial failures, those where sooner or later after the operation we had to remove a few stitches, the rest remaining in place and the infection being eliminated and superficial.

2. Wounds of the soft parts of greater importance..... 106
12 complete failures and 19 incomplete failures.
3. Wounds of the bone without complete fracture..... 148
5 complete failures and 4 partial ones.
4. Wounds of the soft parts with injury to a large blood vessel..... 68
2 complete failures and 5 partial ones.
5. Wounds of the soft parts with injury to a large nerve trunk..... 34
No complete failures: 4 partial ones.

WOUNDS OF THE LARGE JOINTS

1. Wounds of the tibio-tarsal (with 4 cases of astragulectomy)..... 15
No complete failure: 2 partial ones.
2. Wounds of the knee (with 3 immediate resections of the knee joint)..... 22
1 complete failure (cured after secondary resection).
3. Wounds of the wrist (of which 3 presented limited bone lesions of the wrist which necessitated partial excision of the carpus)..... 19
without complete failure but 2 partial ones
4. Wounds of the elbow joint (of which 12 underwent partial resection)..... 19
without complete failure but 3 partial ones.
5. Wounds of the shoulder joint (of which 12 were treated by immediate resection of the head of the humerus)..... 12
without complete failure and 1 partial failure.

WOUNDS WITH COMPLETE FRACTURE OF THE BONE SHAFT

1. Femur..... 24; without complete failure, 2 partial failures.
2. Bones of the leg..... 64; 2 complete failures.
3. Humerus..... 47; 1 failure and 3 partial ones
4. Forearm..... 26; without complete failure; 2 partial ones.
5. Clavicle..... 3; without failure.
6. Ulna alone..... 24; without complete failure, but with 3 partial failures.
7. Radius alone..... 29; without total failure, 2 incomplete failures.
8. Fibula alone..... 44; without complete failure, 5 partial failures.
9. Tibia alone..... 2; with one complete failure.

WOUNDS OF THE HAND AND FOOT

1. Wounds of the hand: injury to tendons, bones or joints..... 60
2 complete failures.

2. Wounds of the foot with lesions of tendons, bones or joints. 50
without complete failure, 5 partial failures.

WOUNDS OF THE SKULL

1. Wounds of the skull without injury to the brain. 14
without complete failure as far as union is concerned but with 3 deaths
and 2 partial failures.

NOTE.—One of these died from progressive meningoencephalitis. We did not suture the skull wounds when the foreign body had not been removed from the brain.

WOUNDS OF THE CHEST

Penetrating wounds, seven, without fracture as far as union is concerned, but with one death.—(Wounds of the chest walls are included in the list of Wounds of the Soft Parts).

It is easy to understand that it is impossible to study in detail each one of these cases and give a complete history. However, it seems useful in order to avoid confusion, to give a few words of explanation. First of all, these statistics include two distinct periods. During the first, extending from July, 1915, to July, 1917, our service was not specialized and received all kinds of wounds, the patients not being fit for evacuation. During this period also—at least during the first six months—we were beginning to use primary suture; and it is during this period that we had the greatest number of cases in which we did not attempt suture. Out of 851 wounds that were not sutured (mentioned above) 768 belong to this first period and 83 only to the second period. During the second period, July, 1917, to the end of December, 1917, the service was changed and received only wounds of the soft parts. It is true that, by mistake, a certain number of bone wounds, a few wounds of joints, and a few fractures were treated. Furthermore, this service being larger than the preceding one, and the conditions in the army being relatively calm, it was possible to keep the wounded all the time necessary. The feeling of confidence in the technique used by us increased daily, and this led us to extend primary suturing to a number of wounds, and the percentage is, therefore, much greater during the second period than during the first. During the first period we primarily sutured 1,046 wounds out of 2,336, a little more than 44 per cent, whereas, during the second period, we sutured 1,491 out of 1,891, wounds, nearly 79 per cent.

During the first period the wounds not sutured primarily subdivide as follows:
Nonoperated. 216, a little more than 9 per cent.
Delayed primary suture, or secondary
suture. 306, a little more than 13 per cent.
Nonsutured. 768, about 32 per cent.
During the second period wounds not primarily sutured, subdivided as follows:
Nonoperated. 107, or 5 to 6 per cent.

Treated by delayed primary suture, or
 secondary suture..... 210, a little more than 11 per cent. and
 Nonsutured..... 83, or 4 to 5 per cent.

A glance at the following table shows this difference:

	First Period	Second Period
Total number of wounds received in hospital.....	2,336	1,891
Nontreated surgically.....	216, 9 to 10 per cent	107, 5 to 6 per cent
Primary suture.....	1,046, 44 to 45 per cent	1,491, 79 per cent
Delayed primary or secondary suture.....	306, 13 to 14 per cent	210, 11 to 12 per cent
Nonsutured.....	768, 32 per cent	83, 4 to 5 per cent

It is extremely difficult, if not impossible, to draw conclusions from these statistics as far as the percentage of wounds that ought to be amenable to primary suture is concerned, and those that ought to be united by delayed primary suture or secondary suture, or, lastly, treated as open wounds until they spontaneously heal. For each one of these two periods corresponds to a different nature of wounds and to a different period of evolution of this surgical technique. During the first period, which includes the last six months of 1915, we sutured from 15 to 30 per cent of all wounds; during 1916 and the first six months of 1917, treating the same kind of wounded, we sutured from 55 to 60 per cent. and during the period, July, 1917, to January, 1918, we treated almost entirely wounds of the soft parts. The primary sutures were almost 79 per cent, but there are three other important factors which influenced this:

1. The time elapsing between the injury and operation.
2. The feasibility of keeping the patient sufficiently long in the hospital, enabling us to discharge the patients only a few days after removing the stitches, and
3. The operative capacity in relation to the number of wounded that are awaiting operation.

It is also necessary to say that the first period of our activity concerned almost exclusively wounded operated on by ourselves, whereas, during the second period, it included the wounded operated on by ourselves and by our assistants working under our direction.

Lastly, I wish to note the following points:

(a) I do not include in these statistics wounds of the abdomen, where the abdominal wound was primarily sutured, as I consider them foreign to our subject.

(b) Joint wounds as far as primary suture is concerned, for the greater part of these joint wounds were only diagnosed during operation and the majority only concerned wounds of the capsule or the

synovial membrane. It would not be fair to compare these with war wounds in general, for we have only had light cases to treat. Those with bone lesions and those where diagnosis was made before operation were treated in the service of Doctor Leriche.

(c) The fractures included in the statistical report correspond generally to the first period. They are far from representing the total number of fractures we have had to treat, and they concern the most favorable cases amongst the latter. Lastly, the statistical report only includes sutured wounds, sutured because the cases were considered suitable, and I warn against the mistake it would mean to draw conclusions applying to any particular class of wounds in general.

I think it useful to relate the phases which gradually brought us to the primary closing of wounds and thus to relate our surgical progress during the war. We must begin by stating that the circumstances were favorable. After two months of traveling—corresponding to the retreat from Belgium, the Battle of the Marne, and the beginning of the Battle of the Aisne, a period during which we had no surgical work to do, we settled in a small town a few miles from the line. There we were able to treat a certain number of gravely wounded and to follow them sufficiently to enable us to note the outcome of our treatment and what war surgery ought to be.

1. PERIOD OF SURGICAL EXPECTATION

Initially we held the optimistic opinion as to the innocuous character of war missiles as far as surgery was concerned, and were satisfied with the disinfection of entrance of the wound with tinctures of iodine, removal of the foreign bodies which were visible, and application of a good aseptic dressing. The only cases where we operated at once were vascular injuries attended by hemorrhage; great injuries necessitating amputation of the limbs; penetrating wounds of the skull or abdomen, and those injured a few days before and arriving with a fully developed infection. All other cases, after dressing, were placed under observation. In the majority of cases after twenty-four to forty-eight hours, fever started, pain became more and more acute and an abundant flow of purulent and foul fluid started and very violent inflammation became obvious. Surgery was then resorted to. Notwithstanding incisions pus appeared in intermuscular spaces, necessitating new and frequent incisions. The general condition of the patient declined rapidly. During this period, gas gangrene and secondary hemorrhage were frequent and in the most favorable cases suppuration persisted. The wounded man was sick for a long time and was not in condition to be transported, and very often became a cripple. This disastrous period lasted from October to the middle of November, 1914.

2. PERIOD OF INCISION

In view of these facts we no longer dressed the wound, but operated immediately on all patients without waiting the symptoms or appearance of infection, firmly believing that their wounds were infected, although there were not yet any clinical signs of infection. (NOTE.—During this period we only received severe injuries, rendering evacuation of the patient by rail impossible.)

In what did this operation consist? Incision of the wounds, removal of foreign bodies (projectiles, fragments of clothing, etc.), and packing the wound with sterile gauze. This period corresponds to the first half of November through the first half of December, 1914. It marked a great improvement. But at this moment we observed in our wounds a period of suppuration, elimination of muscle, fascia and bone splinters, attended by fever during a fortnight; this necessitated changing the dressings two or three times a week. For dressings we used exclusively sterile gauze and never irrigated the wounds.

3. PERIOD OF WOUND TRIMMING

We, therefore, thought it might be possible to do away with this elimination attended by suppuration, by removal of the foreign bodies and all the tissues dead or destined to die. The operation consisted in following the projectile exactly along its track through the tissues; in removing the skin, the connective tissues, the fascia, the muscle and the bones; all that experience had taught us was doomed to elimination, that which provoked infection and kept up suppuration; ending the operation by packing with sterile gauze. This period corresponds to the second half of December, 1914, and January, 1915. A slight fever, between 37.5 and 38 lasted four or five days and very soon the wound became pink and healed normally.

4TH PERIOD. FIXATION WITH IODINE

We then understood that during the operation, we reinoculated the wound surface. For this reason, trying to destroy by fixation these germs on the surface, the idea occurred to us to use tincture of iodine; the result of which for fixation of germs in the skin had for a long time been demonstrated. But in order to have fixation it is necessary that the wound should be dry, just like the skin itself. Therefore, after a complete hemostasis we for sometime used hot air to dry the wound, then gave this practice up and merely used dry gauze firmly pressed on the wound surface, applying tincture of iodine instantly after removing the gauze. This period corresponds to the months of February, March, April, and May, 1915. We may say that it corresponded to the suppres-

sion of pus in the wound; the wound granulated and healed without suppuration and without loss of tissue.

5TH PERIOD. CARREL METHOD, FIRST TECHNIQUE

Towards the end of the month of May, 1915, we became acquainted with the method of Doctor Carrel (first technique described). During the month of June, 1915, we tried his procedure; but, probably through mistake on our part, this technique brought back the evil days of 1914.

6TH PERIOD. PRIMARY SUTURING

We, therefore, in July, 1915, definitely gave up the use of antiseptics and came back to operative surgery. Encouraged by the preceding period of four months, we began to use primary suture in war wounds, doing away with slow healing by granulation and spontaneous formation of the scar. The results were such that we gradually increased the number of cases where we practiced primary suture, and in the cases where we did not try to suture immediately we placed stitches which were tied a few days later, thus realizing delayed primary suture. Then when we were able to keep the patient under our direction we practiced secondary suture in the cases where we had been unable or unwilling to close by primary or delayed primary suture. At this time we had no laboratory at our disposal and clinical signs alone guided us as well for primary suture as for secondary suture. I can not here enter into the detail of the clinical signs causing us to decide this question. This point, is, furthermore, of only historical interest at present. Often when the laboratory enumeration of germs (smear) is in contradiction with the clinical information, we ask the laboratory to make a culture to decide, and generally it is the clinical information which is proved correct. We were led to insist on these successive stages of the evolution of our technique because we consider them instructive. The different steps of our technique correspond to the different phases of improvement we are obliged to go through, and they follow each other in the course of the operation in the same chronological order as in our surgical evolution. Each one of them is of essential importance before taking up the following one.

In the practice of war surgery, according to opportunity, we can stop after the first operation, or at any stage, to take up later the successive steps when opportunity presents. We can thus enumerate at once the different steps of our technique. They are:

1. Incision.
2. Following the track of the projectile and making an inventory of the lesions produced by the same.
3. Excision of dead tissues or those destined to necrosis, including of course the removal of foreign bodies.

4. Hemostasis, completed by fixation of the wound by tincture of iodine.

5. Repair.

In general it is very exceptional that one is not able to carry out these different steps up to No. 4, inclusive. If, however, because of material circumstances at the moment of the operation excision of the tissues is not completely performed at this time, one must, with curved scissors, effect the removal at a subsequent dressing to avoid spontaneous elimination.

When all the steps of the operation, excepting the last (suturing), have been performed, clinical examination helped by the laboratory indicates with precision the moment when one can close the wound, either by delayed primary or secondary suture. We insist upon this point that war surgery has a two-fold duty:

First, and foremost, to prevent infection; and,

Second, to repair carefully the damage caused by the wound and by the operation itself.

TECHNIQUE

CONDITIONS UNDER WHICH IT CAN BE CONTEMPLATED

Before taking up the technique in detail, it seems useful to indicate briefly the conditions which make it possible.

1. An efficient surgical organization is indispensable. It is a mistake which has lasted too long, to believe that a war wound, contaminated by the missile and the fragment of clothing it carries along with it, is doomed to suppuration. Correctly and aseptically operated on at the right moment, all war wounds, with very few exceptions, will unite as though they were aseptic. One must, therefore, attempt to operate with as perfect aseptic technique as in ordinary practice.

2. Sterile rubber gloves are indispensable. It is hardly necessary to say that a surgeon in an ordinary aseptic operation takes a certain pride in not soiling his gloves by contact with the wound; there is all the more reason to avoid contact with the young colonies of germs that are beginning to develop on the surface of the war wound. He must, therefore, operate with the tip of his instruments, forceps, scissors, and knife, and he must only use his index finger for exploring the wound in those very rare cases where he has lost the track.

3. The assistant must do likewise and when he holds the retractors or mops the blood from the wound he must avoid as far as possible contamination of his gloves during the whole operation. The point on which we insist frequently is to wipe the blood by pressure without rubbing. Friction of the wound has two great drawbacks: (a) it con-

taminates the sterile parts of the wound; (b) it entails the risk of causing the operator to lose sight of the little track caused by the missile, which he may have great difficulty to find afterward.

4. The ideal would be to set aside every instrument that has served once, and take up a fresh one. Practically, however, if those instruments which have come in contact with the parts contaminated are wiped carefully with a piece of sterile gauze at once (smooth instruments, like knives, scissors, and retractors), one can, without great risk, use the same instruments during the operation until the moment comes for suturing.

The instruments most frequently necessary are few in number and in general for each operation a box of instruments sterilized in formalin vapor at 50° Centigrade is used and contains: 8 Kocher forceps, 6 Terrier of Pian forceps, 4 towel holders with sharp points, 1 grooved director, 1 knife, 2 thumb forceps, a medium sized curette, a respiratorium, 1 long forceps and 1 Rongeur forceps, 2 pairs of scissors, straight and curved. Generally the latter are of small dimensions.

When, in the course of the operation, we need supplementary instruments, we make use of a special box from which we take the necessary ones. When we come to the suturing of the wound we take the necessary instruments precisely at this moment. Each operation requires a separate set of instruments. Sterilization by means of formalin vapor has always given full satisfaction. Three boxes of instruments are necessary for every operating table working without interruption, provided an orderly is entirely devoted to preparing them. The rotation of the boxes is as follows: One box is in use in the hands of the surgeon, another is in the hands of the orderly who cleans the instruments and prepares them, and the third is in the thermostat.

We can not emphasize the fact too much that the war surgeon, who wishes to succeed in primary suture, must understand that it is a difficult, minute and no brilliant task which he has to take up; but he may be convinced that his results will be in direct proportion to the care he takes in following carefully the track of the projectile; in investigating the injuries produced; in doing away with the culture media; removing minutely the foreign bodies and all bone fragments; and in excising with great care the skin, the connective tissue, the fascia and the muscles forming what has been called the chamber of attrition. Then he will end his operation after careful hemostasis, carefully drying the wound and fixating it with tincture of iodine, by the repair of the injuries due to the wound and the surgical operation. We can affirm that in this work, more than in any other, success rewards effort.

5. In general the patient requires general anesthesia for one never

knows where the wound may lead to, and local anesthesia decreases the resistance of tissues already contaminated by germs. Spinal anesthesia can be used in a number of cases.

6. The most delicate point consists in following step by step the track of the projectile. It is indispensable to see well and the light should be so arranged that the progressively extending field of operation may be seen step by step in such a way as never to remove anything without seeing it well. A frontal mirror with electric light can render service.

7. It is hardly necessary to say that the surgeon must have always present in his mind the topographical anatomy of the region he is operating on. The projectile does not follow ordinary surgical paths, and as we will have to follow it, it is a point of capital importance to always know exactly where we are working from an anatomical viewpoint. The track of the vessels and nerves must be well in mind beforehand; since the wound starting far from them takes us gradually in their vicinity, very often by a quite different path than that followed in ordinary surgical operations. Projectiles take no heed of classical anatomical paths to reach an organ, and furthermore, they often meet a bone in their path which sends them in another direction and thereby creates a new path. All of this creates difficulty, from an anatomical viewpoint; and yet the surgeon must know how to conquer this difficulty without causing more than a minimum of damage to tissues.

This is not all. Muscles underlying each other are not necessarily at the same point of contraction at the time of the injury. At the moment of the operation, under the influence of general anesthesia, the perforations in each one of them do not correspond with the others. We have, therefore, a broken line to follow in these cases, a real difficulty for the operator. Often a matter of capital importance for the war surgeon is a knowledge of the innervation and blood supply of the muscles. I will also have to revert to this point later on.

INVESTIGATION BEFORE THE OPERATION

1. *Radioscopy*.—For a long time we operated our patients without the help of the X-ray outfit. We were thus thrown on our own resources, obliged to follow the missile step by step, and we can affirm that we succeeded comparatively easily in thus removing projectiles the situation of which was unknown to us. This necessity of not losing sight of the track leads the surgeon to follow it very closely. It trains his judgment and gives him sufficient dexterity to perform easily a surgical operation which at first seems not without difficulty. I believe that in the immense majority of cases radioscopic examination is sufficient.

It indicates about where the projectile has remained, consequently about the direction it has traveled. It indicates the size and the number, if there are several. All of this is not without interest. One entrance may lead to two projectiles in the tissues especially when a bone has been met in the path. In this case radioscopic examination will warn the surgeon that he will have to follow a Y-shaped track, the bifurcation taking place at the point where the vulnerating agent has broken up. In other cases it will reveal the existence of a wound or fracture which had escaped clinical examination or merely been surmised.

In the case of multiple wounds by fragments of hand grenade we have often been forced to do away completely with a radioscopic examination, operating on an aluminum table and advised only from time to time by the radiograph with the frontal screen, without, however, allowing ourselves to be guided entirely by it, for here, as well as in other cases, one must follow the track of the fragment, and not, as one is too often tempted to do, go directly for the foreign body by the shortest path. This mode has a two-fold advantage: firstly, it saves time, the time necessary for the radioscopic examination, and, secondly, it enables the surgeon to be constantly informed of the number and size of the projectiles that still remain to be extracted, both of which are important; if one remembers that wounded with multiple wounds are often in a condition of shock and that the operation must be always in proportion to the resistance of the wounded.

2. *Clinical Examination of the Wounded.*—(a) *General Examination.*—I believe it necessary to insist on the importance of complete clinical examination of the wounded before deciding to operate. At once wounds too slight and those which we know to be rarely infected can be eliminated from the operation. Amongst the latter we can mention minute fragments in the face and hands, without injury to the bone and tendons or the joints. Wounds of this kind produced without the projectile having gone through the clothing contain no fragments of cloth which are always loaded with bacteria and which are far more dangerous than the projectile itself. In the same category are included through and through wounds by rifle bullets when the wounds of penetration and exit are both very small, without bone, joint, vessel or nerve injury, and the track of which is neither tympanic nor painful. One can always eliminate—but for contrary reasons—meribunds and those whose general condition contraindicates any kind of operation. It is a delicate question and it is difficult to say when and where the surgeon must take the risk and operate just the same, but he must know at once that the first contraindication to any kind of primary suture is a bad general condition. These cases do not form a part of

our subject matter and I only mention them in order to emphasize the following principle: *Wounded, whose general condition is not satisfactory, must never be primarily sutured.*

The pulse must be examined. It will, far better than the temperature, enable us to foresee at once whether one will do primary suture or not. We have never sutured primarily a patient whose pulse was above 120 when he entered the hospital, and often we have done so, and with success, for others who had a rectal temperature of 38.5°.

Some have attached a great deal of importance to the time elapsing between the injury and the operation; gone so far as to prohibit primary suture for wounded whose injury dated back more than eight hours. In the cases related above, a large proportion were sutured more than twelve hours after the injury; some twenty-four hours after the injury; and we are sure that in a few cases after a longer time. However, it remains an established fact that time is a factor of great importance in making a decision and that the percentage of cases suitable for suture decreases as the time elapses after the injury.

(b) *Local Examination.*—Local examination will also give us information.

First. It is not a long time since we have drawn the attention of surgeons to the importance of recognizing gas wounds before operation. This can be accomplished by nail percussion (filiping) in their neighborhood and we advise strongly once more to make this examination systematically in the region surrounding the wound. Very often we will be surprised to hear a tympanic sound and this mode of investigation alone produces this symptom (tympanitis) that will reach away from the entrance of the wound, far from the projectile and far from the track. We have noticed also that this mode of investigation frequently produces exquisite pain at the point of greatest tympanitis. Research and the injuries invariably found in the course of an operation have proven to us that these tympanitic wounds attended by pain always correspond to gas infection by anaerobic germs. What action must we take as far as primary suturing is concerned? I advise, at least until full information is obtained, not to suture primarily those wounds. They are, however, in the majority of cases, suitable for delayed primary suture. We may say that amongst the 2,537 cases primarily sutured, related above, there are more than 200 where we did not find this symptom before operation and where in the course of the operation we found an excised gelatinous infiltration of a pink color in the connective tissue, both subcutaneous and intermuscular, and yet these wounds united without suppuration, as an aseptic wound would have done.

Second. We must also mention the importance there is, in a clinical examination to determine motor or sensory paralysis. This investigation allows the diagnosis before operation of nerve lesions which we must not forget to repair whenever it is possible.

Third. Vascular lesions, which are often overlooked, must likewise be thought of. They may influence the technique followed in the pursuit of the wound track and likewise the decision one takes at the moment of closing the wound. We may say at once that it is an absolute rule never to suture a wound underlying another one which has caused an injury leading to the ligation of the main artery, irrigating the territory first. Let it be well understood that the great risk of primary suture—gas gangrene—finds its principal factor in the existence of necrotic or badly irrigated muscles, and only a secondary factor in their contamination by anaerobic germs.

A war wound cleared of this necrotic tissue, the cells of which are copiously irrigated by oxygenated blood, can be sutured. The surgeon is warned in sufficient time, by symptoms of which we shall speak later on, to remove the stitches and pack the wound without causing undue risk to the patient.

So much for the wound underlying the arterial lesions. What position must be taken as far as the wound which has caused the lesion is concerned? The factor of the general condition due to hemorrhage being eliminated two cases must be considered: Either the limb is infiltrated with blood, tense, almost double in size, an abundant hemorrhage has taken place in the depth and produced an internal tourniquet. In that case no suture must be attempted. It is often necessary to split widely, even to split the muscle fascia distended by this hematoma. The muscle must be freed, every source of compression removed that would hamper its proper circulation under penalty of having it contaminated by anaerobic germs and to see it become the prey of gas gangrene favored by the enormous decrease in its vitality and its lack of oxygen. In another case the arterial wound has caused but little hemorrhage. It is really a dry wound. The limb is not distended. There is no diffuse hematoma. Under these conditions the wound can be sutured.

Fourth. Clinical examination will also give us information concerning muscular destruction and bone injury.

There are certain wounds of the soft parts offering such an aspect that from the start every surgeon knows that he cannot—and that, even if he could, he should not—perform primary suture. The same holds true in the case of fractures.

Fifth. There are frequent cases where the patient has multiple

wounds. It is perhaps in these cases more than anywhere else that the clinician must take precedence over the surgeon. Sometimes, judging the capacity of resistance of the wounded, he will hesitate to add further shock due to the operation or he will be obliged to decide which one of the wounds claim immediate operation. In these cases he will limit himself to a careful laying open of the wound, sometimes even leaving without operation the less important injuries which he would have completely operated on, and sutured if they had been alone. All this the clinician can learn from examination of the wounded before taking up his instruments, but even in the course of the operation the surgeon must rectify the initial decision, deciding for or against suture according to the aspect of the lesions which he sees in the course of the operation, although he might initially have expected to close the wound.

THE OPERATION ITSELF

1. *The Incision.*—The first moment of the operation consists in incising the skin, excising at the same time the cutaneous border of the wound and the track in the subcutaneous connective tissue down to the fascia.

But if in peace time surgical operations are always well regulated, the surgeon knowing from the start what he will have to do, it is not so in war surgery. In the first case one knows from the start the length and direction necessary for the incision and it is very exceptional that one is obliged to prolong or to deflect it in the course of the operation. In the second case, on the contrary, one does not know beforehand what lesions or infiltrations will be met in the course of the operation. For this reason with data collected by clinical examination and by radioscopic examination concerning the direction of the wound track and its depth, and also the underlying organs, we decide on a general direction more commonly parallel to the axis of the limb and the length of the incision which will initially be relatively limited.

Having immobilized the skin in a position which produces concordance between the skin wound and the track in the underlying subcutaneous tissue, we excise a small skin flap with the subcutaneous tissue, oblong in shape, by two slightly curved incisions passing about one centimeter from the lips of the wound, and joining each other approximately three centimeters further away. Thus suture will enable us to get a linear scar.

I insist on the point that it is unnecessary to excise too much skin. Generally one centimeter outside of the wound is sufficient. It is, however, necessary in certain cases to be less economical in this excision. Let us repeat it, economy of tissue must be the rule of the war

surgeon. No more for the skin than the muscles, must the war wound be considered like a malignant tumor, that must be taken out in one block and as extensively as possible. I can not insist too much on the fact that dead tissue must be removed and the same for tissue destined to die. But this only must be removed; and I am convinced that in the matter of removal many who have sinned by being too conservative are at present sinning in the opposite direction.

The skin and underlying adipose layer in the initial portion of the track we remove without any instrument becoming contaminated. We now have a little gap five or six centimeters in length, except in cases where a large skin wound has already obliged us to make a greater excision. However, it is exceptional that we give it greater dimensions at the start. We prefer increasing it as the need arises, inwards or outwards, as the course of the operation necessitates. In this way the ultimate incision will never be greater than necessary.

2. *Following the path of the missile.*—With a few clips of the curved scissors we remove, if necessary, a few fibers of connective tissue, expose the fascia, and easily recognize the perforation through which the projectile has passed.

Two clips of the curved scissors, increase this opening and remove its debris. Two Kocher forceps grasp the lips of the opening which is in the form of a cone that already allows us to see a certain depth into the muscle the path followed by the missile. The split fascia and underlying muscle in the direction of the track allows us to see better and to bring to the surface this part of the tunnel. If bleeding occurs it is immediately sponged. The small arteries are ligated with very fine catgut, the strands being cut very short. This can often be done by a single knot, often even, if the ligature has included some muscle tissue, we remove with the scissors the small stump thus formed.

We note the aspect of the muscle surrounding the track laid bare. One has thus a clear sight of the track through the first muscular layer. With the aid of curved scissors cutting sharply, we excise this muscle, removing only dead muscle fibers, which do not bleed, which have lost their normal color and which do not react by fibrillary contraction under the influence of pinching with the forceps. It is well understood that we will have to remove in the course of the operation all foreign bodies and fragments of clothing found in the field. Hemostasis is then carried out. Retractors spread the wound and very often one sees the track of the projectile continuing in the underlying muscle. Retractors expose to the eye and the instruments of the surgeon greater and greater depths of the wound track. Very often we have followed a projectile the size of a pea through the thigh or through the buttock down to the

bone through a cutaneous opening of not more than eight to ten centimeters and we may say that with careful hemostasis one can complete the operation in the majority of cases. When we deal with a through-and-through wound, situated, for instance, in the thigh, and occupying the greatest diameter of the limb; we follow the track through one of the wounds; the one which appears to be the least traumatized; then about midway leave a small gauze packing and start at the other extremity until we join the first. In a case where a projectile has almost gone through the thigh but has become lodged a few centimeters from the skin on the opposite side, we follow the track from the entrance until we reach the axis of the limb and after opening on the opposite side we go directly to the projectile until we reach the path we initially excised. This following of the track is often easy, but not always so. It is possible to lose one's way, and in this case one must avoid above all things utilising the grooved director for exploration. It will merely create artefacts. It is by careful inspection of the point where the track has been lost sight of that one has the greatest chance of picking it up again. It will appear in the shape of a little blood clot or an adherent fragment of clothing, or a simple ecchymotic spot of the muscle. It is by lifting, by drawing a little sideways a few muscular fibers that one will find one's way again. If we lose our way at the deep surface of a muscle, let us recall the physiology of the underlying muscle and see if shifting of the two muscles has not caused the formation of a broken line which we have mentioned. Let us, therefore, retract a little above and below the first muscle; ask the assistant to impart a few slight movements to the limb and we will often have the agreeable surprise of seeing the lost trace reappear. If all this leads to nothing, let us find the nearest edge of the muscle, detach its surface from the underlying tissues and thus we will find the injury to the underlying muscle either by its new path or by taking up the first, but we will be careful not to infect the sliding surface of the two muscles, for sometimes we will discover here a few fragments of cloth that the projectile had left there and the sliding muscle had dispersed.

Sometimes things are more complicated yet. Let us suppose the case of a projectile which, instead of traveling in a perpendicular direction to the axis of the limb, has traveled in a longitudinal direction. We begin as follows: After following the track as far as possible through a sufficiently large opening but without its being excessive, we mark the point where we stop by a little gauze mop, and then by a second incision underlying the first one we go back to this gauze mop and then continue the pursuit of the wound track. If this second opening does not allow us to reach the projectile, it is very rare that a third incision taking

us directly down to this foreign body, does not allow us by retrograde progression to find the second stopping point, thus having exposed the whole wound track. Several times we have utilized these ladder incisions and our objective has always been attained. We cannot repeat too often that the track must be followed; that it must have been seen in its entirety, passing everywhere the projectile has passed, and it is one of the important factors of success in primary suture. Certainly it may succeed in other cases where the track has not been followed, for the whole extent of the track is not contaminated. We have noted that the wound track was contaminated by fragments of clothing, especially in the initial centimeters of its length and where it went through the fascia and bone. We, therefore, sometimes, in order to avoid anatomical injuries out of proportion with the gravity of the lesion, wipe out part of the track with a sterile piece of gauze, pulled through by forceps, going exactly through the track and dragging it through in the direction supposedly followed by the projectile; but it is necessary to remember at the time of closing by suture that this slight deviation of the rule has been made, and not to forget it either, in carefully watching the patient after the operation if one has notwithstanding decided to suture primarily.

3. *Inspection of the Track; Inventory of the Damage done; Excision.*—We have now followed the wound track completely. We have already removed all foreign bodies and bone splinters, if there were any. We have excised the cutaneous wounds. We have removed the majority of the muscle which is dead; excised when necessary; and we have investigated all the damage done.

(a) Nerve lesions will be immediately repaired by suturing any nerve that happens to be cut. If there is only a partial wound to the nerve without complete section it is sometimes well to reinforce the union by a stitch bringing together the neurilema. Unless there is a special indication, such as the proximity of fracture, we do not enclose the nerve in muscle or other protective tissue.

(b) Vascular injuries will be treated later on.

In the majority of cases double ligature will be necessary, taking care to place the ligature one centimeter above the injury and to excise the injured portion of the blood vessel. It is seldom that the vessel can be sutured. However, in small lateral wounds we recommend suturing the vessel, provided the neighborhood is healthy. But we know the nefarious effect of projectiles in the neighborhood, producing secondary hemorrhage; of the development of aneurism and must, therefore, be very circumspect in this regard. Very often arterial lesions, even if important vessels are concerned, are disclosed only

in the course of the pursuit of the wound track. They had bled very little, the perforation being momentarily and very rapidly obliterated by blood-clot or reflex vasoconstriction, or in the cases of complete section, by retraction of the middle tunic, become manifest in those cases when we detached the blood-clot covering the opening. Often, it is possible to treat these lesions easily through the path followed but sometimes one meets with very great difficulties and often absolute impossibility. Therefore, we always have in our service a tourniquet within reach of each operating table.

Often the artery lesions are recognized at the time of the clinical examination. From the viewpoint of the technique that is to be carried out, two things may occur. Either we consider the direction of the track will enable us to easily expose the arterial injury and we follow this path, or considering at once that this path is impossible or too risky we begin the operation by an incision which leads us directly to the artery. We treat this and primarily suture this aseptic wound. Then as though there had been no arterial injury we treat the track of the missile. When the lesion affects a large venous trunk we incise in the same way but in such a case the tourniquet is unnecessary; compressive packing of the wound is sufficient until the ligature has been completed.

(d) *Bone Injuries.* It is necessary to remove all splinters met. With the Rongeur forceps we must freshen the bone wound when there is only an incomplete fracture. When there is a complete fracture it is necessary to remove the splinters as completely as possible, taking particular pains to preserve the periosteum and the underlying osteogenic tissue, the importance of which has been so well emphasized by Doctor Leriche. It is necessary to inspect the bone marrow to remove that which is in the vicinity of the focus of the fracture but not remove the marrow extensively, as we have seen it done sometimes.

Articular bone lesions must be treated according to their importance: either by classical excision of the joint at once or by regularization of the focus of the fracture when that is possible.

(e) We think it advisable, to insist on what must be done in the way of muscular and fascial excision.

In general the aponeurosis, which is resisting, is simply perforated by the projectile. Sometimes the tear extends a little beyond the perforation which is always fringed by shredded tissue. These shreds must be excised for a distance of a few millimeters, but the most important thing is to inspect them carefully, for often one here finds minute fragments of clothing adhering to the tissues which are most important factors of infection. Intermuscular fascia must likewise be

inspected with particular care and we advise the removal of a little layer of muscular fibers, often healthy, which adhere to the fascia at this point in order to have a clearer sight and not allow those little fragments of clothing to escape, for they are very much to be feared. Sometimes it is necessary to inspect both faces of this tendinous layer, to split above and below the opening and to turn out the two margins on Kocher forceps, thus exposing its deep aspect to the eyes of the surgeon. This is likewise necessary to enable one to follow the track later on.

(f) Tendons which are in the way of the projectile must likewise be minutely inspected. When they are cut they must be sutured after freshening. When suturing is impossible they must be sutured to a neighboring tendon; in a word, one must at once perform in their case the operation necessary for the best functional repair. If they have only been brushed by the projectile they must be cleansed of minute fragments of clothing which may adhere to them. Their wound must be treated the way old surgeons used to do with an amputation stump, and they must be reinforced with a catgut stitch if this treatment has increased their initial injury, rendering them weak enough to jeopardize their solidity.

Sometimes, in wounds of the wrist and the ankle we have been in the necessity of dissecting, to cleanse and repair them, the extensor or flexer tendons the way we would have done for the removal of tuberculous synovitis, and thus to obtain, after primary suture, a perfect functional repair.

(g) We must not forget to excise as completely as possible this subcutaneous or intermuscular tissue infiltrated by dark blood or transformed into a kind of pink or brownish green gelatinous substance. Surgeons do not like to meet with this condition for it is often a prelude of grave infection and accompanies generally the tympanitic tracks already mentioned.

(h) Lastly, the muscles (soft tissues gorged with blood) explode very often under the influence of the impact. The roughness of the artillery projectile and especially the enormous speed which all war projectiles acquire, produce in these tissues lesions of explosion and commotion which stupefy and kill these organs which are of a relatively delicate texture. Experience has shown that grave infection occurs in war wounds, owing to a two-fold factor: (1) Mortification of the muscle which becomes an excellent culture medium in the well regulated thermostat of the human body. (2) Microorganisms are introduced by fragments of clothing carried by the missile. The first of these factors is by far the most to be feared, and the second without the help of the first is very often not able to produce its effect.

We must therefore remove all the necrotic portion of the muscle, but only that part that represents the culture medium. Certainly, in the beginning, the surgeon must hesitate in determining exactly what he must remove and what he must leave. Sometimes, he removes too much, sometimes he does not remove enough, and it is only his personal experience which will teach him, the exact line of separation between the two. It is essentially a question varying according to the nature of the case, varying also with the nature of the wound, and the depth of the track. There are some cases when any muscular excision is unnecessary. There are others where it is necessary in the extremities of the track. There are others, finally, where removing a few fibrils may be sufficient, but there are others where it will be necessary to remove considerable masses of muscle; even, in certain wounds already the prey of gas gangrene, whole muscles at a time. There are, however, certain signs which can guide the surgeon. These are three in number:

First: Normal coloration of the muscle;

Second: Bleeding of muscle, when tested by a minute clip of the scissors;

Third: Fibrillary contraction, when the muscle is stimulated by pinching with the forceps.

Sometimes the muscular track presents normal coloration. It is sufficient then to inspect it to remove little fragments of cloth that may be present, and to freshen it by a few scissors clips. In this case muscular excision is practically unnecessary. Very often the track is of a graying hue, even black. In such a case the superficial layer of the track must be removed. In general it is unnecessary to remove a thick layer; half a centimeter is often sufficient, sometimes less. It is rare that more is necessary, unless there is gas infection. In those cases we recommend to examine carefully the fresh section of the muscle thus produced, to see whether there is any open space between the muscular fibers, or a few cut fibers the extremity of which, retracted at once after the injury, may have carried with them little fragments of clothing.

Sometimes one finds the muscle paler than usual—pinkish in hue or coppery, and very often in this case the first excision, always performed with curved scissors, and about one centimeter from the surface, offers a section which presents the same aspect.

The blood oozing on the surface similar to a pinkish dew is not to be seen. True, we can see a little blood jet from a little intramuscular artery which we have cut, but that is not the sign enabling us to say the muscle is normal. Moreover, if the muscle is stimulated by pinching slightly with the dissecting forceps it does not react by the little fibrillary contraction, which is so characteristic.

What do we do in such a case? We advise splitting the fascia of the muscle about which we are in doubt, giving it breathing space and allowing it to spread out freely; then wait a few minutes, taking up another part of the wound. One will then be surprised to see this muscle, pale a few moments ago, the section of which did not bleed, that did not react when pinched by the forceps, offer now simultaneously these three symptoms. The muscle was apparently suffocated and the scissors freed the tissue, allowing it to recover life. It is really a live muscle and its excision would have been unnecessary.

If, on the contrary, after this trial, it does not manifest its vitality we must excise it progressively, still using the curved scissors, and taking off a layer of a few millimeters at a time until the necessary characteristics appear beyond a doubt. That is precisely the reason why we repeat the quantity of muscle to be removed varies essentially according to the case and we appeal to the tact of the surgeon, who, thanks to these symptoms, very soon acquires sufficient judgment to decide what must be removed and what can be left.

In other cases the small artery has infiltrated a muscle with blood. With a few clips of the scissors we detach the principal clots. It is often possible to leave a few dark spots resulting from this infiltration of blood without risking to compromise the primary suture.

I have already specified, but judge necessary to repeat once more, that by bleeding muscle we must not understand bleeding from a cut artery, but that little capillary oozing that appears like a pinkish dew on the whole surface of the section.

I will not insist any more on the sign of fibrillary contraction in response to stimulation by pinching. It must be constant at the proximal end of muscular fascicles which we examine; but it may fail at the distal end, depending on the condition of the nerve supply. Let it be well understood—what is important is to free the wound of all tissues whose life is finished. We must, therefore, leave in the wound no fragment of dead muscle and instruct our assistant not to traumatize with retractors or Kocher forceps the delicate muscular tissue, the vitality of which is easily compromised, creating one of the important factors of grave infection following war wounds.

One has doubtless noticed how much I insist on the use of curved scissors. They must cut sharply, not with their point but with their belly, cutting tangentially to the surface and for this work they are infinitely superior to the knife. The latter may prick with its point, and thus inoculate; and the stimulation it produces in the muscular fibers it cuts often causes the underlying ones to have reflex contraction, sometimes even carrying with them into the depth of the muscle little fragments of

clothing, their contaminated extremity not having been excised. I apologize for repeating once more that muscular excision must be economical; muscle may compensate and adapt itself to a new function, but it does not regenerate. Therefore, in the great majority of cases—I would almost say in all cases—one must avoid cutting the muscles transversely. Apart from the interruption in the muscle itself, which may be restored by primary suture, one must not forget that, by so doing, one cuts as well the nerve and the blood supply of the underlying part and the dangerous consequence is obvious. Without its being necessary to insist on the fact it is obvious that the distal end will no longer receive its proper nerve supply, and suppression of the arterial blood jeopardizes the vitality of the distal end, being capable sometimes of causing necrosis, with formation of gas infection and at the least causing a failure of the primary suture. For instance, we know how grave from a functional viewpoint are transfixing wounds of the calf and yet we can affirm that if they are judiciously treated they almost always heal by primary suture. The difficulty the surgeon so frequently meets in these cases, is due to a two-fold cause: the blood supply of the calf muscles and the presence of the thick intramuscular aponeurosis of the soleus muscle (the large muscle bodies of the first named are supplied almost exclusively, each one independently, by a single artery). If one of these arteries is cut, either by the projectile or in the course of the operation, the vitality of this muscular mass is so much lessened that the worst disasters may be feared and one must abstain from primary suture in all of these cases.

As to the intramuscular flat tendon of the soleus, it is situated in a deep portion of the limb, concealed by a thick layer of tissue and the projectiles often carry to this point the fragments of clothing.

One sees at once what risk would involve a wound of this region, if it were sutured without the surgeon being certain not to have left any foreign body unnoticed.

If, notwithstanding, in certain cases one feels compelled to cut a muscle crosswise, one must not do so unless one has to deal with a muscle receiving its nerve and blood supply at several points so that one can afterwards by suture restore its anatomical continuity. It is in a majority of cases preferable, if feasible, to work round the muscle, passing in that way the obstacle which it presents, and take up the track through this new path, without omitting the examination of the small portion of the track that could not be investigated by the direct path.

I admit, however, that there are cases where one must expect functional sacrifice of a muscle, but at least it is a rare exception, and only to be made when cutting crosswise would involve a graver risk still.

Two words can sum up what this excision of muscle tissue ought to be: No avarice; no prodigality.

4. *Drying and Fixation with Tincture of Iodine.*—The inventory we have made has allowed us to recognize unavoidable losses of tissue and to clear the situation. Let us now say a word in regard to repairing as well as possible without causing the patient to run any risk.

As we have said hemostasis has been insured in the course of the operation. This hemostasis must be very thorough for two reasons: First, it must prevent the formation of hematoma, so favorable for suppuration; secondly, the wound must be completely dried so the fixation of its surface can take place under the action of tincture of iodine. We, therefore, completely dry each wound with gauze pressed on the wound surface and rapidly removed at the precise moment when the wound is abundantly swabbed with tincture of iodine. Immediately another dry gauze mop wipes up the excess of tincture of iodine. If the fixation has been well done, the whole wound surface becomes dry as though varnished and assumes a coppery hue which is absolutely characteristic. This procedure, if correctly carried out is of great importance. Certainly, we do not pretend that a wound which has not been treated in this way will necessarily suppurate. Numerous facts would contradict my statement at once, and we do not resort to this mode of action in simple cases, where the pursuit of the wound track has shown us healthy tissues which require no excision, and also in superficial wounds, which are totally excised. On the other hand we have already explained how we were led to this treatment, and we believe that the small number of failures shown in our statistical report, is due partly at least to the careful carrying out of this step in the operation.

We took up tincture of iodine (5 per cent) as a fixating agent because we used it before the operation for fixation of the superficial layer of the skin before the operation and because it is a simple procedure, and we always have this solution at hand; but are ready to abandon it for any other fixating agent which will offer more advantages, and which will not have the drawback we are about to mention.

Tincture of iodine fixes not only the superficial microorganisms but also the underlying superficial cells of the wound. As a result a slight secretion of serum takes place, turbid, which oozes out between the stitches of the wound or along the capillary drainage when there is one. This produces no drawback; not even that of having to renew the dressing, as it drains in the deepest layer of the same. It is only necessary when capillary drainage has been used and one inspects the wound to remove this drainage on the third or fourth day. Furthermore, the slight serous elimination delays the cicatrization for four or five days.

It is for this reason that we advise removal of the stitches on the twelfth or even the thirteenth day only.

This slight drawback has a favorable consequence. It allows, when one judges it necessary, to put off the primary suture till the eighth or ninth day. We have even some cases of delayed primary suture performed on the tenth and twelfth day.

5. *Suturing*.—As the words “primary suture,” “delayed primary suture” and “secondary suture” are coming more and more into use, it is necessary to understand clearly the meaning attached to each one of them, to avoid designating the same thing by two different names. For our part, we understand by immediate primary suture the normal termination of the operation we have just described. The suture takes place immediately after the excision and treatment of the wound.

Delayed primary suture consists, without further excision or freshening of any kind, of the repair of the anatomical layers (when the gap in the fascia is not too great to bring them together), or the skin alone. It consists, therefore, in taking up the operation, which is at this time carried to its end, after an interruption of a variable number of days.

On the contrary, secondary suture consists in closing the wound after excision, either of all the scar-tissue in one mass or only an epithelial border and a narrow strip of skin in the neighborhood, and part only of the granulation tissue, when one can not do likewise.

We, therefore, think it advisable to distinguish two kinds of secondary suture. In one, one removes the scar tissue as a whole, and reconstructs all the layers of the flesh wound thus produced. This might be called secondary suture with anatomical reconstruction. In the other, which might be called secondary suture of the skin, one limits oneself to excision of the epithelial border allowing the granulation tissue, entirely or in part, according to circumstances, to remain.

As far as we are concerned we always suture the wound primarily when we deem it advisable; when we do not do so, our patients are followed clinically and bacteriologically in view of delayed primary suture. When we can not perform the latter, we strive to perform secondary suture as far as possible. In these cases we prefer an anatomical repair of the wound except when it is impossible for one reason or another, and in this last case we perform a secondary suture of the skin alone.

I do not propose taking up the technique of secondary suture. The only reason I mentioned it was to emphasize the following fact. When we cannot suture primarily the treatment of the wound consists in a simple, dry aseptic dressing, without the use of any antiseptic, the dressing being renewed every five or six days. At each dressing it is necessary

to make sure there are no necrotic fragments to be removed. Should there be any they are detached by a snip of the curved scissors. Then we wash the skin surrounding the wound with oleate of sodium, dry with a gauze mop and ether and paint the surrounding skin with a little tincture of iodine.

Wounds treated in this way do not suppurate, or very slightly. Sometimes during a week in the interval between two dressings the wound is slightly grayish but very soon becomes pink. In a word, when primary suture and delayed primary suture are both impossible we trust to the vital power of the patient for the disinfection of the wound—without striving to destroy the microorganisms, leaving this to the phagocytes and being very careful not to interfere with the process of autoimmunization of the patient.

Laboratory examination can be used as to the cellular and microbic condition of the wound, more by cultures than by smears. It is the general condition of the patient on the one hand, the aspect and evolution of the wound on the other, and, furthermore, the *absence of streptococci* that will enable us to decide when it is possible to suture.

We are convinced that our patients treated in this way are ready for secondary suture as if they had been treated by the Carrel method.

It is unnecessary to describe in detail the technique of the primary suture of the wound. Suffice it to say that the different anatomical layers are repaired whenever possible and that the security can be increased by using the capillary drain, composed of three or four silkworm guts which are removed on the third or fourth day; but there are often cases where we do not place any at all.

It is useful to note that for the repair of the different layers with buried sutures, one must use nothing but fine catgut, starting from the principle that every foreign body and animal tissue favors suppuration of the wound even if it contains very few germs. For the same reasons, we cut the strands of the ligature very short and avoid strangulation of the tissues.

We end by applying dry sterile dressing and immobilizing the operated region as far as possible.

POST OPERATIVE CARE OF THE PATIENT

This is very simple. Unless there be a special indication the dressing is changed at the end of twelve or thirteen days, in order to remove the stitches when there is no capillary drainage. At the end of three or four days to remove this drainage, if one has been made. In such cases a second dressing is necessary to remove the stitches. In the great majority of cases the wound unites by first intention and from the fifteenth to the eighteenth day no more dressing is required.

I must also mention that after suture the mobilization of the operated region must be avoided, for as I have already said, we close wounds which are not sterile from a bacteriological point of view. Their evolution is that of a sterile wound because we have removed by operation the great factor of infection, and the defense of the organism does the rest. Nature has foresight and realizes immobilization of an infected region. We must imitate it in immobilizing the region we have operated upon. It is for this reason the results of primary suture would not be as good were one obliged to evacuate the patient and make him travel prematurely. However, this period is relatively short.

I attach greater importance to the symptoms of pain. In principle, twelve hours after the operation the patient ought no longer to suffer. I do not refer, of course, to pain produced by motion or pressure on the wound. It is spontaneous pain which must call our attention, and in particular when the patient complains that the dressing is too tight. If the wounded complain, being very careful in eliminating the nervous susceptibility of the patient, we must remove the dressing. Often one discovers the cause of the complaint of the patient to be hematoma, when stitches must be removed, the bleeding vessel sought for ligature and the wound packed with gauze, delayed primary suture being performed two or three days later; or else we have to do with beginning infection and then all the stitches must be removed, the wound completely laid open and packed.

This spontaneous pain is in my judgment the capital symptom to indicate that primary suture was unwisely performed.

CONTRAINDICATIONS

This is the most delicate point of the method. I mean discussion of the indications and contraindications to the primary suturing of war wounds.

From the start I must say that all, or almost all, war wounds which can be correctly treated in due time should be sutured as soon as possible. Many of our wounded leave the hospital on convalescent leave, around the twentieth day, sometimes even a little earlier.

Let us now see what points deserve attention in the days that follow the operation. Three points are important: Temperature, pulse, pain.

Very often there is a certain rise in temperature—38, 38.5 rectally during the first two days, sometimes during the first three days; then rapidly the temperature falls to normal. Certain of our cases reach a temperature of 39 degrees. This does not trouble us especially and nothing unfavorable takes place. It is only a prolonged rise of temperature that calls for an examination of the wound. If in examining

the wound there is found a little redness over one of the stitches, gentle pressure over the surrounding zone is made. If this pressure is painful it is better to remove the stitch. If on the contrary pressure is painless, we can leave the stitch in.

The pulse of the patient gives more precise information. In general the pulse ought to be normal, between 72 and 80. If it is more frequent, even without rise in temperature, one must watch the wound very carefully, but one need not be alarmed. More commonly, the pulse becomes rapidly normal. In the contrary case other symptoms (pain, temperature, general condition) warn the surgeon that something abnormal is taking place. I will, therefore, not speak of indications but of contraindications. These are based on manifold reasons.

Some have no relation to the patient, or the wound, or the surgeon; they are not based on technical reasons but rather depend on the material circumstances which can not be modified. Thus, for instance, when the influx of wounded is clearly out of proportion with the limited operative capacity. Contraindications of this nature I will leave out of our discussion.

Other contraindications of a purely technical order, on the contrary, we must examine with care. We will divide them in two groups. First absolute contraindications; second, relative contraindication.

A. Absolute Contraindications.—They are the following:

1. The patient reaches the surgeon at a relatively late period after the injury. He is already suppurating or presents a zone of lymphangitis around the wound, a little streak of lymphangitis a certain distance from this, and swelling of the lymph gland in the neighborhood. We need not insist on this contraindication, which is obvious.

2. The same applies evidently to patients who arrive, sometimes only a few hours after their wound, but already with confirmed and extensive gas gangrene.

3. One must in no case, excepting joint wounds (and often in this case the suture must be limited to the synovial membrane and the capsule), suture primarily a patient whose general condition is bad. But what must be understood by bad general condition? Whenever a patient is shocked, whatever may be the cause of this condition. In a majority of cases of shock, except these due to hemorrhage or shock due to intoxication, the wounded should be watched and given general treatment before deciding to operate. A wounded man who is very anemic, owing to much loss of blood, whose pulse is equal to or above 120 beats a minute (emotive causes of this acceleration being eliminated), should not be primarily sutured. This is the meaning we give to the words bad general condition. Contraindication to any primary suture.

4. When one has to deal with a shattered limb, or even certain injuries of the soft parts, and one hesitates about the advisability of a primary amputation.

5. We have already said that no wound underlying another wound which involves arterial injury necessitating the ligature of a vessel ought to be sutured primarily.

These are the absolute contraindications, and we see that they can be reduced to two general ones: Either the wounded presents an infection too advanced to enable one to think of primary union, or else the circulation, general or local, is so impaired that by suturing the wound one would cause the patient to run the greatest risk on account of the favoring factors for the development of anærobic germs.

B. Relative Contraindications.—Let us now see what contraindications may exist in individual cases. It is here especially that the tact and clinical sense of the surgeon must guide him and where the clinician can in certain cases stop the hand of the surgeon who might be too anxious to close his wound at once.

These contraindications are numerous. Let us examine them successively:

1. The time elapsed since the injury has been noted when we examined the patient before operation. We do not attach absolute value to this factor to decide at what precise moment primary suture ought no longer to be practised. Certain surgeons have spoken of eight hours as being the limit. I am not of this opinion. There are cases where one must not suture primarily even if one can operate within the first two or three hours. There are others where one can suture much later, about the twenty-fourth hour. However, the result of the study of the flora of the wounds shows in a peremptory manner that the longer the time elapsed since the injury the greater becomes the importance of the microorganisms, and it is natural to take into account for final determination the time that has elapsed since the injury. But I can not and will not fix any precise moment.

2. The same applies to the temperature taken before the operation. Initially I have never sutured any patient whose temperature was above 38. Our personal experience has taught us that one can with impunity close the wound in a patient whose temperature reaches 39; provided there be no other contraindication. These patients must be followed with special care, and the fever presented before the operation will really be of more importance in guiding the surgeon after the operation than it had at the moment of the suture itself.

3. Does the finding of a painful, tympanitic zone around the wound before the operation and the presence of a gelatinous and pinkish or

greenish connective tissue at the time of the operation constitute a contraindication to primary suture? When one is certain to have seen the whole of the track; to have excised all this gelatinous edema and to have found tissues having normal characteristics of vitality, in a word, when the surgeon is well satisfied with his work, the wound may be closed, but I advise to be very prudent and until one has gained experience, preferably resort to delayed primary suture in such cases.

4. I have already said what I think of wounds having produced an arterial lesion, and I have mentioned that they can be sutured primarily; first, when the general condition of the patient is favorable, and, secondly, when the wound is not infiltrated by blood. When the wound is infiltrated by blood it ought not to be sutured—more with a view of preserving nutrition of the limb than from fear of infection.

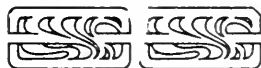
5. One must not suture cases where one has found in the course of the operation lesions of explosion, mortification, large quantities of clothing; not forgetting, however, that it is often possible in these cases to perform a delayed primary suture if they have been correctly operated on. It is simply a question of prudence.

6. When one finds in the course of the operation the whole wound track with a grayish appearance it is preferable to postpone the suture.

7. When the wound is peppered with a multitude of little fragments as frequently occurs when a hand grenade explodes in the vicinity, the vitality, if not jeopardised, is at least markedly lessened. Greater care is necessary in suturing such cases.

8. When the whole wound track has not been seen, either because the guidance thread has been lost or for other anatomical reasons, one has to be very circumspect. It is true that primary suture may succeed but if it fails it is unnecessary to seek an explanation elsewhere than in this fact.

9. If one is in doubt about asepsis of instruments and material used, it is obviously necessary to leave the wound open in these cases and resort to delayed primary suture.



A REPORT OF A SERIES OF FORTY-FOUR CRANIO-CEREBRAL INJURIES OPERATED UPON IN THE ZONE OF THE ADVANCE WITH THE A. E. F.

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AT the time of reporting these cases to Colonel Harvey Cushing, Chief of the Neuro-Surgical Service of the A. E. F., about November 25, 1918, there were eleven deaths in this series, or a mortality of twenty-five per cent. On January 8, 1919, seven of the remaining thirty-three cases were dead. I did not learn of the death of one of them until August 16, 1919. At the present time, to the best of my knowledge, twenty-six of the forty-four cases remain alive, giving a mortality of forty-one per cent.

The writer, as Chief of the Neuro-Surgical Service at Evacuation Hospital No. 8, had only one surgical assistant and made all his pre-operative and post-operative neurological examinations and notations himself. As Chief of Surgical Team No. 66, his work was not confined to head and spinal injuries alone; but included the usual debridements, amputations, and the ligation of greater vessels. The work being divided in this manner, it was very difficult to do full justice to the Neuro-Surgical Service.

Every case with head injury was completely shaved without using clippers to avoid short hairs clinging to the scalp. Two skiagraphs were then taken; one antero-posterior, the other lateral. An attempt was always made to note the depth of an intro-cranial foreign body, if metal. The patient was given morphine $\frac{3}{8}$ grain hypodermatically. At the operating table, patient sitting with a roll under the neck, the scalp was washed with soap and sterile water and carefully wiped off with alcohol. The cases that required suboccipital exploration or decompression were placed face downward on a regulation stretcher, the forehead resting on one of the slings stretched between the two handles and the stretcher placed on the operating table. Making a mental picture of the style of incision desired; tripod, Isle of Mann, or crucial, and its possible extent, a block of scalp was injected. A larger needle was then pushed down to the peri-cranium injecting deeply within the block. Large wounds often required plastic flaps of scalp to cover cranial defects, even when necessary to leave a large area of intact skull denuded. 30 c.c. of a one per cent Novocain solution to which 1 tablet of 3/200 grain adrenalin was added, was usually sufficient.

Excision of the wound was then done down to the skull and the

excised soft parts, knife and thumb forceps placed in the dirty basin. Three incisions were now made to the excised wound in such a way as to facilitate the approximation of all edges. Rat tooth forceps were placed in the edges of the cut superficial fascia at $\frac{1}{4}$ inch intervals and bound together by a strip of sterile gauze by passing through loops of handles and fastened to sterile sheet serving at the same time as retractors and a sure means of hemostasis, enabling the operator to work alone if necessary. Trepanation of the skull followed with removal of a block of bone; triangular, quadrangular, or pentagonal,¹ as the case might be, drilling three, four, or five holes and cutting between them with a DeVilbiss forceps.

In the frontal and occipital regions where the skull is thick and dense and the defect small, the opening in the skull was simply enlarged by the use of rongeurs in order to leave as small a skull defect as possible. The wound was thoroughly swabbed with alcohol, gloves changed, and sterile towels fastened to the under layer of the scalp with a few linen sutures. A soft nosed rubber catheter was now passed through the laceration in the dura to locate pieces of indriven bone and other foreign bodies which were removed with a delicate forceps. Pulped brain and debris were removed by the patient's coughing and by irrigating the track through the catheter with warm sterile saline solution from time to time as foreign bodies were located and removed during the progress of the operation. Only in cases where no definite track in the brain existed and shell fragments were widely scattered was the finger used to locate them, and then gently. When the track was clean, a small amount of pure ethyl alcohol was injected on the withdrawal of the catheter. The dura was left open leaving a decompression opening. The wound was again swabbed out with alcohol and the scalp closed in layers using a 20 day chronic No. 1 in the galea and silk or silkworm gut sutures superficially, silk impregnated with wax preferred. All wounds were closed without drainage unless badly infected. This was the technique followed in cases where the foreign bodies could be removed through the wound.

In cases where the shell fragment or bullet was near the surface opposite to the wound of entrance, either occipital or frontal, or opposite hemisphere, the writer turned down an osteoplastic flap searching for the foreign body with a telephone probe² avoiding the live areas.

¹ Pentagonal trepanation was performed when by so doing the skull defect might be smaller.

² The telephone probe used at Evacuation Hospital No. 3, consisted of an ordinary telephone receiver with a cartridge shell attached to one wire and a 14 inch silver probe attached to the other wire. Taking care that the metallic cartridge shell did not come in contact with metal fillings, it was placed in the patient's mouth and when the probe came in contact with a bullet with the casing intact or a fragment of steel, a sound like a faint sputtering of overcharged electricity was elicited.

Turning down the dura over a portion of brain with a foreign body near the surface, edema was always present, and sometimes subdural hemorrhage or clot. Cerebral and meningeal vessels found bleeding were ligated with fine silk. Where infection was present and the meninges greatly thickened meningeal hemorrhage was controlled by applying small silver clips. On the completion of the operation it was sometimes found that the edematous brain, which would extrude as soon as the dura was opened, would not permit of suture of the dura. In these cases the bone flap was replaced and the scalp sutured in layers. In cases where a cerebral hernia was present it was cut away during the first stage of the operation.

Very often extensive lacerations with large cranial defects made it necessary to cut large scalp flaps to cover the defects in the skull, often leaving a denuded area of intact skull exposed. Injuries to the sinuses were plugged with muscle graft, if small, and covered with a piece of peri-cranium turned inside out, if large, which controlled hemorrhage absolutely if gently kept in place for a minute or two.³

SUMMARY

1. All head injuries should be considered serious until proved otherwise, by exposing the skull.

2. The first stage of the operation is the dirty stage and all instruments used about soiled wound and in performing trepanation of the skull should be discarded, wound wiped out with alcohol, and gloves changed.

3. The track should be painstakingly cleansed and all foreign bodies removed if possible. Pure ethyl alcohol in the track does not increase edema and sterilizes the track as effectively as any antiseptic and leaves no residue.

4. The dura should not be closed leaving a decompression for edema which is always present and an outlet for any possible subsequent infection.

5. Osteo-plastic flaps turned down counter to the wound of entrance for removal of a foreign body are justifiable, even though the dura cannot be closed because of edema.

6. Debridement of the skull (simply enlarging the hole in the skull with rongeurs) should be done in frontal or suboccipital regions where the bone is thick and a small skull defect preferable, unless the injury is over a sinus, when trepanation should always be done so as to completely expose the sinus.

³"A Report of Wounds Involving the Head and Spine Cared for at Evacuation Hospital No. 8, A. E. F." *THE MILITARY SURGEON* for April, 1920.

7. In large egg-shell fractures of the skull an effort should be made to cleanse the track in the brain, if any; but bone fragments extradural should not be removed or disturbed, and a conservative debridement of the soft parts performed followed by suture and a small rubber drain, if infected.

The technique followed is that described by Dr. Harvey Cushing in a reprint from the British Medical Journal, February 23d, 1918, except that ethyl alcohol was used in the track at completion of the operation instead of Dichloramine-T.

I cannot help but feel that the mortality in this series of cases would have been much lower if the cases had remained quiet for three months or longer before evacuation.

No magnet or photographic outfit was available at Evacuation Hospital No. 8.

CASE REPORTS

Case 1.—F. C. G. 1038736. 10th F. A., Bat. A. Duration: 6 hrs.

Patient brought from Shock Ward, totally blind.—*Diagnosis:* G. S. W. Large depressed fracture occipital region, profuse hemorrhage, longitudinal sinus widely lacerated, marked comminution of bone. Muscle hastily removed from back just prior to operation.—*Operation:* Bone fragments carefully removed at some distance from sinus and bone lying directly over sinus with piece of muscle in thumb forceps. On removal of bone found sinus widely lacerated for three inches almost to Trochlear. Sinus hastily plugged with muscle and held in place by a trellis-work of fine catgut.—Patient died a few minutes after completion of suture of scalp in layers before he could be removed from operating table. Doubted advisability of operating, but did so in effort to stop hemorrhage.

Case 2.—R. W. G. 566312. 77th F. A., Bat. D. Duration: 8 hrs.

Diagnosis: Neurol. ex. Dilatation of both pupils speech slow, weakness but no spasticity, projectile vomiting, no paralysis. D. B. P. 72, S. B. P. 112, C. S. W. right occipital lobe, depressed fracture right occipito-parietal region with laceration of dura and indriven bone fragments.—*Operation:* Excision of scalp wound, debd. of skull, removal of six pieces of internal table from occipital lobe, varying in size from finger nail little finger to one-half small pea, also removal of small fragments of bone and brain debris from a depth of 5 cm. Small silver clip on bleeding vessel in thickened dura. Scalp sutured in layers.—Evacuated.

Case 3.—A. B. 2470606. 320 Inf., Co. L. Duration: 6 hrs.

Diagnosis: Large G. S. W. left fronto-temporo-parietal region, severe, extensive laceration of brain, foreign body lodged deeply in occipital lobe left side.—*Operation:* Excision of scalp wound, removal of fractured bone and foreign body 2 cm. x 4 cm. Suture of scalp in layers.—Evacuated.

Case 4.—V. C. 1830521. No other information possible.

Diagnosis: Did not comprehend what was said to him when addressed in English; but understood a little Italian and always answered in Italian. Delirious, spasticity both arms and legs, some dilation left pupil. C. C. F. of left temporal bone just over and behind the bony meatus and the lateral sinus, dura lacerated, two-thirds of left ear shot away. One piece of bone 1 x 1 cm. driven 5 cm. into temporal lobe.—*Operation:* Numerous small pieces of bone including the one deeply located in the

temporal lobe removed, all located by catheter. Brain debris gently removed by warm saline solution irrigation. A small amount of alcohol left in track on withdrawal of catheter. Frontalis and temporal muscles turned down in a partial flap to cover defect in skull. Plastic operation on scalp and ear to cover.—Died.

Case 5.—J. M. S. 3175242. More information could not be obtained.

Diagnosis: Perforating wound of right frontal lobe. Wound of entrance a little to the left of the longitudinal sinus, sinus not injured, exit outside of outer canthus right eye.—*Operation:* Debd. scalp and skull extensive linear fracture of vault, fragments of bone removed from track, brain debris removed by gentle irrigation through catheter, scalp sutured in layers.—8th day post-operative: Stitches removed. Tendency to break down in outer wound.—12th day post-operative: Eye-grounds negative.—21st day post-operative: Irrational, talks in a rambling manner, restless. Temperature 103. Pulse 90.—22d day post-operative: Diverging strabismus, carphologia, irrational but not noisy. Temperature 101.8 axilla, pulse 136 to 150, no rigidity of neck.—23d day post-operative: Temperature per axilla 101.2, pulse 160, irrational, hiccough, respirations shallow and rapid, carphologia. Spinal puncture (lumber): 10 c.c. slightly cloudy fluid withdrawn, tension slightly increased, which revealed streptococci on culture.—Died 23d day post-operative.

Case 6.—B. E. S. 1838842. 319 Inf., Co. L. Duration since tagged 16 hrs.

Diagnosis: Unconscious. Has had several right-sided convulsions accompanied by twitching right side of face. Knee-jerk positive plus Babinski left side present. Gutter wound of left fronto-temporo-parietal region with laceration of lateral sinus and anterior branch of middle meningeal artery. Injury to central gyrus, post-central gyrus, angular gyrus, and superior temporal gyrus left side.—*Operation:* Debd. scalp, pericranium, and skull. A piece of muscle packed against lateral sinus. Anterior branch of middle meningeal artery ligated. Six pieces of bone removed from brain. Pulped brain substance extruding during operation. Temporal muscle brought down to cover defect skull as much as possible. Suture of scalp in layers.—Died 6th day post-operative.

Case 7.—A. H. 146th Inf., Co. C. Duration: 38 hrs.

Diagnosis: Marked mental hebetude. Depressed fracture of right occipito-parietal region.—*Operation:* Excision of scalp wound, trepanation of skull, ligation of lacerated posterior branch of middle meningeal artery, thirteen bone fragments removed from brain. Debris removed from brain by coughing and catheter irrigation and warm saline solution. Plastic operation on scalp to cover defect.—Evacuated.

Case 8.—H. O. 3490007. 47th Inf., Co. G. Duration: 75 hrs.

Diagnosis: G. S. W. back of head. Copper bullet casing lodged in right lobe of cerebellum. *Operation:* Excision of scalp wound, debd. skull rongeurs, removal of copper bullet casing, suture of scalp in layers.—Evacuated.

Case 9.—B. C. 361 Inf., Co. M. Duration 56 hrs.

Diagnosis: G. S. W. face, entrance beneath right eye, perforating antrum of Highmore, and lodged at base of brain intra-cranial.—*Operation:* Removal of foreign body not attempted. Loose fragments of bone removed and some debris (pulped brain substance) by catheter suction. Bone fragments in track located by catheter. Wound in antrum leaves a large opening into right naris. Wound sutured without drainage into antrum because of large communication with nose.—Evacuated.

Case 10.—F. M. 139149. 147 Inf., Co. A. Duration: 7 days. Home address could not be obtained.

Diagnosis: Depressed fracture of left sub-occipital region with injury to transverse sinus and abscess of left lobe of cerebellum small foreign body presumably

in the abscess.—*Operation*: Tripod incision, removal of depressed fragments of bone. Muscle graft to plug hole in sinus and control hemorrhage. Opening into abscess enlarged, followed by a foul smelling discharge of pus and brain debris. Drain down to dura, scalp sutured in layers. Ex. previous to operation revealed marked mental hebetude and indifference making it impossible to make a proper ex. for cerebellar symptoms, moderate dilatation of left pupil, reflexes apparently normal. Marked cellulitis of back of neck for which a crucial incision was made.—Unfortunately I have lost my post-operative notes in this case; but as I recall the case at this time (Oct. 31) he gradually improved for four or five days after his operation when he suddenly ran a very high fever which came down to normal on the third day from which time he rapidly improved until evacuated about Oct. 24. At one time post-operative he showed adiadokokinesis in left arm and leg also nystagmus to right and left.—Evacuated.

Case 11.—R. G. 2159633. 130 Inf., Co. I. Duration: 5 hrs.

Diagnosis: G. S. W. head, penetrating, entrance through right eye and foreign body about 4 mm. \times 3 mm. Located by X-ray in right temporal region above external auditory meatus and intracranial. Right eye destroyed. Depressed fracture of bony orbit with exception of upper inner one-fifth.—*Operation*: Supra-orbital incision, catheter run into track, seven pieces of indriven bone located by catheter and removed, brain debris sucked through catheter. A small amount of alcohol passed into track on withdrawal of catheter. Incision sutured in layers. Enucleation of remaining sac of right eye.—Two weeks after operation referred to Lieut. Col. Lillienthal for attention to chest (4 foreign bodies in chest, signs of fluid in chest). Patient also had multiple wounds of left arm and hand. Left hand developed an infection which gradually cleared up. Removal of the foreign body was not attempted.—Patient evacuated.

Case 12.—P. J. E. 27057318. 130 Inf., Co. I. Duration: 11 hrs.

Diagnosis: G. S. W. gutter, right frontal region with laceration of dura and brain, and indriven bone fragments.—*Operation*: Excision of scalp wound, trepanation of skull, track gently irrigated with warm saline solution, five bone fragments removed from brain, scalp sutured in layers.—Died 39 days post-operative at Base Hospital at Vichy, France.

Case 13.—R. V. R. 138126. 146 F. A., Bat. C. Duration: 16 hrs.

Diagnosis: Mentality fair. Both pupils equal. Spastic paralysis right arm and leg; some weakness left leg. G. S. W. of left occipito-parietal region with shell fragment 8 cm. within brain, and indriven bone fragments. *Operation*: Excision of scalp tripod incision trepanation of skull with cleansing of track by catheter and warm saline washing. Foreign body and two pieces of bone removed. A small quantity of alcohol was left in track on withdrawal of catheter.—Evacuated at U. S. A. General Hospital No. 29, Fort Snelling, Minn., Feb. 24, 1919. Spastic hemiplegia in right side persists.

Case 14.—P. G. A. 2101492. 58th Inf. Co., B. Duration: 13 hrs.

Preoperation note: Spasticity moderate left leg, weakness left arm. Mentality slow. Pupils neg. Babinski left side. Both knee-jerks exaggerated. *Diagnosis*: Gutter wound right fronto-parietal region extending back to lambdoid suture with extensive fracture of parietal bone, laceration of dura and escape of brain substance.—*Operation*: Excision of scalp, trepanation of skull, small pieces of bone removed from brain, brain debris removed by gentle irrigation with warm saline solution. Suture of scalp in layers.—Evacuated. Aug., 1918, "Left arm is getting stronger every day. My head is entirely all right now."

Case 15.—H. F. W. 183183. 318 Inf., Co. H. Duration: 18 hrs.

Preoperation note: Spasticity right side. Impossible to obtain further information.—*Diagnosis:* G. S. W. left occipito-parietal region. Depressed fracture and indriven bone fragments. Escape of brain substance.—*Operation:* Excision of scalp, trepanation of skull, removal of fourteen pieces of indriven bone fragments of various sizes also brain debris by catheter and warm saline irrigation. Closure of scalp in layers.—Evacuated.

Case 16.—W. B. 2472588. Duration since tagged: 18 hrs. No other information obtainable.

Preoperation note: Both knee-jerks exaggerated. Double Babinski. Marked spasticity right lower limb. Flaccid paralysis right upper limb.—*Diagnosis:* G. S. W. vertex, entrance 12 mm. to left of longitudinal sinus. Foreign body somewhere in brain near base just above floor of anterior fossa or in anterior fossa.—*Operation:* Excision of scalp, trepanation of skull, removal of fragments and brain debris from track in pulped brain, usual technique. Left temporal decompression, large subdural clot and active hemorrhage, foreign body not located and blood gently removed aided by irrigating with warm saline solution. Hemorrhage stopped of its own accord. Scalp closed in layers.—Died, October 7, 1918.

Case 17.—I. S. K. 560154. 58th Inf., Co. K. Duration: 19 hrs.

Preoperation examination: Stuporous, difficult to arouse, restless.—*Diagnosis:* G. S. W. T. T. W. of both frontal lobes with extensive destruction of frontal lobes.—*Operation:* Excision of wounds, removal of a few pieces of loose bone, irrigated brain gently with warm saline solution. Did not debd. skull or remove all the fragments of bone because so extensive. Plastic on scalp to cover defects with suture of scalp in layers.—Evacuated.

Case 18.—J. B. 2313795. 4th Inf., Co. E. Duration: 13 hrs.

Preoperation note: Marked spasticity of right leg, moderate spasticity of left leg. Dilatation of both pupils.—*Diagnosis:* G. S. W. occipito-parieto-parietal region near vertex with extensive destruction of scalp down to skull. Extensive linear fracture without apparent depression. Symptoms of intra-cranial pressure.—*Operation:* Subtemporal decompression left side. Large clot, much blood left side of brain. Dura left open, temporal muscle sutured, scalp closed in two layers. Excision of large scalp wound. Impossible to completely suture scalp at this site.—Died.

Case 19.—R. S. 3169929. 132d Inf., Co. C. Duration: 24 hrs.

Diagnosis: G. S. W. head and leg. S. W. left temporal region, foreign body just within cranium at base of nose. Wound connected with frontal sinus. Track into frontal lobe.—*Operation:* Incision over eye, debd. of skull, track washed out gently with warm saline solution, numerous pieces of bone removed, foreign body located on cribiform plate of ethmoid left side and removed. Skin sutured in layers.—Evacuated.

Case 20.—S. P. 1286874. 116th Inf., Co. A. Duration: 33 hrs.

Preoperation examination: Exophthalmus left eye, sight gone. All reflexes exaggerated. Partly conscious.—*Diagnosis:* Two G. S. W. of head: 1 right temporo-parieto-occipital region, skull intact, two perforating wounds of skull, entrance left fronto-parietal region, foreign body just to left of mid-line roof of mouth to mucous membrane, but mucous membrane intact. G. S. W. L. forearm.—*Operation:* 1 debd. of scalp, suture; 2 removal of foreign body through mouth excision of wound, tripod incision with extension of one leg over temporal region, debd. skull, removal of four pieces of bone from frontal lobe at varying levels. Feel confident that missile must have passed through the cavernous sinus left side.—9th day post-operative:

Temperature 102.6 per axilla. Very restless and talkative.—11th day post-operative: Profuse hemorrhage from wound which has broken down. (Injury to cavernous sinus communicating with left post-ocular space?).—12th day post-operative: Anemic and quiet. No repeated hemorrhage.—18th day post-operative: Temperature 104 per axilla. Restless and irrational. No signs of meningitis.—19th day postoperative: Appears quite normal. No temperature.—20th day post-operative: Appears normal, no temp. Sleeps quietly.—26th day post-operative: Died. Brain abscess.

Case 21.—E. S. No number. 115th Inf., Co. C. Duration: 15 hrs.

Diagnosis: G. S. W. left occipito-parietal region with foreign body size 3 cm. x 3 cm. in brain.—*Operation.* Tripod incision, debd. scalp and skull foreign body and four pieces of bone removed from brain, usual technique. Suture of scalp in layers.—Evacuated Aug. 1919, letter stating that he is perfectly well.

Case 22.—G. O. B. 2118706. 116th, Inf., Co. A. Duration: 18 hrs.

Diagnosis: G. S. W. right occipito-parietal region close to mid-line, depressed fracture laceration of dura, extrusion of brain substance.—*Operation:* Debd. scalp, tripod incision, trepanation of skull, removal of six pieces of bone from within brain to a depth of 5 cm. Small amount of alcohol left in track on withdrawal of catheter. Suture of scalp in layers.—Died.

Case 23.—T. M. 368041. 114th Inf., Co. H. Duration: 38 hrs.

Preoperation note: Spastic paraplegia-spasticity very marked in left side. Modified Babinski left side, ankle clonus left side.—*Diagnosis:* G. S. W. vertex skull.—*Operation:* Excision of wound, tripod incision, trepanation of skull, lacerated dura, sinus apparently uninjured. Nine fragments of bone of inner table, and in-driven bone of outer table removed from brain, left side of falx through tract at varying depths down to 7 cm.—Evacuated. A letter from his wife in early February, 1919, states that he still has trouble with his right foot; but walks about with a cane and is quite normal in every way. July 23, 1919, Jacksonian Epilepsy affecting right arm and leg. One attack six weeks previous.

Case 24.—F. P. 2793849. 129th Inf., Co. E. Duration: 16 hrs.

Preoperation note: Knee-jerks exaggerated, hypersensitive, pupils equal, stupor.—*Diagnosis:* Wound of left fronto-temporal region with depressed fracture of left temporal bone just above the ear. Twenty-seven pieces of a hard stone removed from beneath muscles and within skull. Depressed bone removed with debd. skull. Dura intact but tense, does not pulsate. Dura opened and large amount of brain substance and black clot welled out. Profuse squirting hemorrhage from middle cerebral artery, artery ligated with fine silk. Thorough debd. of muscles done at beginning of operation, also scalp. Muscles sutured, scalp sutured in layers.—Patient did not recover from stupor dying 7th day post-operative, October 22, 1918.

Case 25.—E. J. L. 1287298. 114th Inf., Co. C. Duration: 14 hrs.

Preoperation note: Exaggerated reflexes left side diverging strabismus, hemorrhage from nose and bloody sputum.—*Diagnosis:* G. S. W. right occipito-parietal region with destruction of area of scalp. Four foreign bodies extra-cranial, three foreign bodies intra-cranial.—*Operation:* Debd. scalp and skull, removed all extra-cranial foreign bodies, and brain debris by catheter and warm saline irrigation. Three intra-cranial foreign bodies and fourteen pieces of indriven bone removed; one of the intra-cranial foreign bodies removed from the lateral ventricle which was open and discharging cerebro-spinal fluid. Foreign bodies located by X-ray.—5th day post-operative, 10 a. m.: Lumbac puncture, 10 c.c. slightly cloudy fluid slightly increased tension withdrawn. Symptoms of cerebro-spinal meningitis.

Laboratory report (Lieut. Pettit) red blood cells, 7,500 per cmm. a few leucocytes present chiefly mono-nuclears, approximately 50 per cent. Many chains of streptococci in smear. Culture later showed the organism to be a hemolytic streptococcus.—5th day post-operative: 1:30 p. m. Died.

Case 26.—R. E. 1382279. 129th Inf., Co. M. G. Duration: 9 hrs.

Preoperation note: Paralysis left arm which disappeared before operation although weakness still persists. Knee-jerk left side exaggerated.—*Diagnosis:* G. S. W. right temporo-parietal region with fracture of skull with laceration of dura and loss of brain substance.—*Operation:* Debd. scalp down to skull, tripod incision, trepanation of skull, three pieces of bone removed from a depth of 3 cm. brain debris removed by gentle warm saline irrigation. Suture of scalp in layers.—Evacuated.

Case 27.—R. K. No number. 60th Inf., Co. C. Duration: Not known.

Operated upon Oct. 15, 1918, by Captains Foote and Tupper suspecting foreign body in middle ear right side. Facial paralysis right side.—*Preoperation note:* called in consultation Oct. 18, 1918. Paralysis of sixth and seventh cranial nerves right side, paralysis of sixth does not seem to be complete, deafness right ear. Cannot protrude tongue. Skull turned and tilted strongly to the left. Spastic hemiplegia left side. Babinski present left side with knee-jerk absent. Stupor which Captain Foote says was very recently developed. Hemiplegia developed before stupor. At the time of first operation only the seventh and eighth cranial nerves were affected. Pulse 50. Decided to explore and at least decompress to relieve intra-cranial pressure.—*Operation:* Large osteoplastic flap turned down in right temporo-parieto-occipital region. Marked congestion of cerebral vessels with bulging of brain. Brain pushed gently aside with brain spoon and a sharp projection felt just posterior to the internal auditory meatus which felt like a small steel fragment embedded in the bone. Removal not attempted because of great edema of brain rendering it impossible to work without lacerating brain. Needles passed into lateral ventricle and 10 c.c. of cerebro-spinal fluid withdrawn but found to be only under slightly increased tension, and bulging brain did not recede. The dura was then slit in three places to margin of bone enlarging decompression area. Dural flap laid back over bulging brain and not sutured. Osteoplastic flap and scalp replaced and scalp sutured in layers.—Oct. 19, 1918: Slight haziness of both optic discs. Very difficult to ophthalmoscope. Captain Foote.—3d day post-operative, Oct. 20, 1918: Stupor gone. Talks and acts rationally.—Wide awake. Spastic hemiplegia persists.—6th day post-operative, Oct. 23, 1918: Normal mentally. Wound clean. All stitches removed. Left sided hemiplegia persists. Eyes normal. Able to protrude tongue moderately.—9th day post-operative, October 26, 1918: No change in condition during the last four days. Wound healed perfectly.—13th day post-operative, Oct. 30, 1918. Moved left leg voluntarily today. Repeats it when requested; but it requires a great deal of mental effort and movement is slow. Spasticity present entire left side. When he attempts to move left hand spasticity increases and clonic contractions occur.—Evacuated.

Case. 28.—T. D. 61153. 101st Inf., Co. G. Duration: 12 hrs.

Preoperation note: Moderate spastic paraplegia and marked spastic paralysis of left arm. A little difficult to get patient to answer questions correctly. Diverging strabismus. *Diagnosis:* (1) G. S. W. left fronto-parietal region down to skull, skull intact; (2) G. S. W. right occipito-temporo-parietal region with three small foreign bodies in brain, two in right hemisphere, one in left laceration of dura and indriven bone fragments.—*Operation:* (1) Debd. of scalp down to skull, suture; (2) Debd. of scalp, crucial incision debd. of skull, removal of six pieces of indriven bone and

brain debris removed by catheter and warm saline washings. Track very deep foreign bodies not removed.—Died.

Case 29.—C. F. 2d Lieut. 4th Inf. Duration: not known.

Diagnosis: M. G. Bullet wound head perforating entrance right temporal region, exit left eye. Totally blind both eyes, left sided hemiplegia, unconscious, lacerated left eye removed, debd. of wound entrance down to skull and nothing further done as it seemed that patient would die in a short time. Patient sent to brain ward.—Oct. 28, 1918. Died.

Case 30.—B. H. 2854134. 357th Inf., Co. C. Duration: 25 hrs.

Preoperation note: Kernig's sign present, complains of pain and stiffness in neck. Lumbar puncture 15 c.c. bloody fluid drawn from spinal canal, which had a peculiar appearance due to strands of a mucoid appearing substance. Possible meningitis. Decided to wait and hold under observation.—Oct. 26, 1918: Temperature 101, Pulse 68. Still suspect a little meningitis; but decided to operate because general condition much improved.—*Diagnosis:* Gutter wound right occipito-parietal region, brain involved.—*Operation:* Debd. of scalp, tripod incision, debd. skull with removal of depressed fracture one large piece of outer table. Six pieces of inner table removed from brain as deep as 7 cm. Brain debris removed through catheter with warm saline irrigation. Small amount of alcohol left in track. Lumbar puncture performed at completion of operation even though the laboratory report on the first one was negative as an already existing meningitis was suspected and if examination in laboratory had verified the diagnosis of meningitis, operation would not have been performed. 5 c.c. of an amber colored, slightly cloudy fluid was obtained. Sent to laboratory. Oct 28, 1918: Symptoms of meningitis very pronounced. Lumbar puncture: 15 c.c. of cloudy fluid withdrawn and 15 c.c. of antistreptococcic serum injected before withdrawal of needle; because streptococci were present in culture taken from brain at time of operation, even though the cultures taken from the previous two spinal fluids were negative. 5th day post-operative, Oct. 29, 1918: Unconscious. Died 3 a. m.—Blood agar transplant: streptococcus non-hemolytic.

Case 31.—C. S. 2853134. 357th Inf., Co. C. Duration: 22 hrs.

Preoperation note: Spastic hemiplegia right side Jacksonian convulsions right arm. *Diagnosis:* Gutter wound left occipito-parietal region, fracture of skull with laceration of dura and brain.—*Operation:* Debd. of scalp and skull with removal of 10 pieces of bone at varying levels as deep as 5 cm. Patient complained of pain in right arm during removal of pieces of bone from track, speech slow, difficult to correlate thoughts. Suture of scalp. Evacuated.—Oct. 6, 1920, letter from mother stating that spastic hemiplegia persists. Can grasp a cane with right hand, but cannot release his grip. The thumb seems to be much better than the rest of the hand.

Case 32.—E. F. 2398302. 38th Inf. Co. F. Duration: 16 hrs.

Diagnosis: G. S. W. gutter right fronto-temporo-parietal region with extensive fractures of frontal and temporal bones.—*Operation:* Eight pieces of bone removed from frontal lobe conservative debd. of skull. Incision over vertex to form plastic flap to cover defect. Suture in layers. Debd. of superficial portion of wound to skull at first stage of operation.—Died.

Case 33.—A. A. 2217645. 357th Inf., M. G. Duration: 16 hrs.

Diagnosis: G. S. W. right temporo-parietal region with depressed fracture, laceration of dura and brain, no indriven bone fragments.—*Operation:* Debd. scalp, trepanation of skull, removal of decompressed inner table fragments, brain debris removed by warm saline irrigation through catheter. Small amount of alcohol

left in track on withdrawal of catheter. Scalp sutured in layers.—12th day post-operative.—Died.

Case 34.—P. K. German prisoner.

Unconscious. Spasticity right side.—*Diagnosis*: G. S. W. entrance right eye; three small foreign bodies in right hemisphere and one large foreign body in left hemisphere, two cm. below surface of brain anterior to the motor area.—*Operation*: Large osteo-plastic flap turned down over left temporo-parietal region, large sub-dural clot and edema of brain. Clot gently removed aided by warm saline irrigation. Foreign body intra-cerebral, surface unbroken, located by careful probing with telephone probe anterior to motor area and removed. Flap replaced, dura not sutured because of edema, scalp sutured in layers. Foreign bodies in right hemisphere to be removed and track cleaned a little later if patient survives and condition permits.—9 p. m. Ceyne-Stokes respiration, died.—Too busy to post.

Case 35.—II. B. 2425249. 101st Inf., Co. F. Duration: 21 hrs.

Unconscious after being struck.—*Diagnosis*: G. S. W. frontal bone over left eye above the frontal sinus with depressed fracture, laceration of dura and one fragment size of 1st phalanx little finger in left frontal lobe of brain. Brain debris removed by means of catheter and warm saline irrigation. Small amount of alcohol left in track on withdrawal of catheter. (Moderate debd. of skull because of location debd. of scalp tripod incision.)—*Operation*: Piece of bone removed from brain. Skin sutured in layers.—*NOTE*: Patient very nervous and restless in spite of one-half grain morphine by hypodermic. Temperature 98.6.—Evacuated.—August 16, 1919: Has been reoperated on twice. Wound did not heal completely until July 20, 1919. Still complains of some headache.

Case 36.—B. K. 1958454. 323d F. A. Duration: 7 days.

Preoperation note: Nystagmus to left, vertigo with tendency to fall backwards, adiadochokinesia affecting left side. X-ray reveals foreign body intra-cranial a little above and posterior to foramen magnum.—*Operation*: Sub-occipital decompression left side approaching median line. Foreign body located by means of telephone probe in veriform fossa, very gently keeping close to dura. Foreign body partly in cerebellum, left lobe, possibly involving vermis, lower part left side. Foreign body removed, small amount of alcohol in wound, dura closed, neck sutured in layers.—Evacuated.

Case 37.—E. P. 2808702. 360th Inf., Co. C. Duration: 24 hrs.

Neurological Examination: Dilatation of both pupils. He says that all things are blurred. Both knee-jerks exaggerated, hyperexcitable.—*Diagnosis*: G. S. W. occipital region just above occipital protuberance.—*Operation*: Excision of wound, tripod incision debd. of skull just above left transverse sinus, and about 15 mm. to left of trochlear herophylli, dura lacerated. Seven pieces of indriven bone removed from left occipital lobe of brain, track 3cm. deep, foreign body found in skull above depressed outer table, brain debris removed by irrigating with warm saline solution through catheter. A small amount of alcohol left in track on withdrawal of catheter. Scalp sutured in layers.—*NOTE*: Patient says he walked 2 miles after being wounded; but had difficulty because of blurred vision.—Evacuated.

Case 38.—A. H. 2851467. 359th Inf., Co. G. Duration: 43 hrs.

Diagnosis: M. G. wound of mid-frontal region to the left above nose with loss of brain substance and cerebro-spinal fluid. Suspect that wound connects with nose because of loss of blood and cerebro-spinal fluid thru nose. Patient nervous and restless. G. S. W. mid-frontal region with fracture through frontal sinus into left frontal lobe of brain through cribriform plate of ethmoid left side, with fracture of portions of both superior maxillae. Large track running diagonally back to base of

skull a little to the right and in front of the foramen magnum. Bullet located previous to operation by two X-ray plates taken at right angles through the courtesy of Capt. Geo. E. Alleman.—*Operation:* Debd. of wound down to skull, tripod incision, one leg extending to right on forehead, debd. of frontal bone with removal of seven pieces of bone superficial in frontal lobe, brain debris removal by gently irrigating with warm saline solution, thirty pieces of bone removed from track. Large rifle bullet resembling in length a French bullet copper jacket removed from base of skull extra-cranial, a little above and in front of the foramen magnum, resting on basilar process occipital bone.—3d day post-operative: Cerebro-spinal fluid and mucus discharging from nose. Mentally normal. Evacuation noted in official report.

Case 39.—C. M. 2853350. 359 Inf., Co. D. Duration: 32 hrs.

Diagnosis: Neuro. ex. Neg. left temporo-parietal region with large depressed fracture, laceration of dura and brain with four indriven bone fragments, wound infected and foul smelling. Culture taken from brain.—*Operation:* Excision of infected wound down to skull, trepanation of skull with removal of depressed bone and four indriven bone fragments to a depth of 5 cm., brain debris removed by gentle irrigation with warm saline solution and patient's coughing, small amount of alcohol left in track on withdrawal of catheter. Plastic operation on scalp to cover defect, incision over vertex to secure additional flap not sutured. Remainder of scalp sutured in layers.—2d day post-operative: Temp. 104. Pulse 96. Wound dressed, small rubber tube inserted under scalp to dura through open vertex incision.—6th day post-operative: Wound badly infected, opened and washed out with Dakin's solution.—*Spinal puncture:* 20 c.c. of cloudy fluid under increased tension withdrawn. *Laboratory report* (Captain Pettit): Red count 4,740 per cmm., 200 white cells chiefly polymorphonuclear leucocytes, direct smear neg. Refer to official report.—Died.

Case 40.—P. S. 3113454. 315 Inf., Co. F. Duration: 43 hrs.

Preoperation examination: Spastic paraplegia, double Babinski, toes inverted, knee-jerks exaggerated, spasticity of left arm, mentality slow, general condition very poor. Difficult to decide whether to operate or not; but decided to give the patient the benefit of the doubt.—*Diagnosis:* G. S. W. Vertex of skull with extensive linear and depressed fractures, laceration of dura and brain with laceration of longitudinal sinus on right side for a distance of 3 cm., wound discharging pus.—*Operation:* Excision of wound down to skull, removal of a few pieces of indriven bone ligation of meningeal artery and hemorrhage from longitudinal sinus controlled by placing a piece of peri-cranium over the laceration, depth of track in brain 6 cm. Patient very anemic and nauseated before operation. Extensive plastic operation on scalp to cover defect in skull. Patient returned to shock ward, blood transfusion 12 hrs. later. Dec. 2, 1918: Small hernia cerebri, spasticity both lower limbs, general condition good.—Evacuated.

Case 41.—R. H. S. 2992604. 324 Inf., Co. D. Duration: 21 hrs.

Diagnosis: G. S. W. penetrating mid-frontal region with depressed fracture, laceration of dura and brain, two pieces of bone 4 cm. in frontal lobe close to falx, longitudinal sinus apparently uninjured.—*Operation:* Excision of scalp down to skull, wound very dirty, tripod incision, trepanation of skull, removal of indriven bone and brain debris by catheter and warm saline irrigation, small amount of alcohol left in track. Scalp sutured with silk worm. Rubber tissue drain left down to dura because of dirty condition of wound.—23d day post-operated.—Evacuated.

Case 42.—E. G. G. 3720324. 322 Inf., Co. D. Duration: 27 hrs.

Diagnosis: G. S. W. left upper mastoid region with a piece of steel resembling

a bullet deep in neck, foreign body along side of sixth cervical vertebra left side. Depressed fracture left mastoid region with laceration of lateral sinus, dura covering brain intact.—*Operation:* Excision of wound, debd. of skull with removal of depressed bone fragments, laceration sinus plugged with muscle graft, foreign body removed through incision in neck. Wounds sutured with drainage in neck. Plastic operation on ear.—Evacuated.—Letter of Aug., 1919: "Get sick to my stomach very easily. Wake up in middle of night with a startled sensation; very easily exhausted; pricking sensation in left side of head."

Case 43.—F. R., 3209836. 324 Inf., Co. D. Duration: 22 hrs.

Preoperation Examination: Photophobia, marked weakness in left arm. Patient says he has no control over it and does not know where it is.—*Diagnosis:* G. S. W. Right parieto-occipital region with laceration of dura and brain and extensive fracture of the skull.—*Operation:* Excision of scalp wound down to skull debridement of skull, removal of depressed bone; brain debris removed by gentle irrigation and suction, alcohol left in track, scalp sutured in layers.—23d day post-operative: Sight normal, left arm normal; general condition good.—Evacuated.

Case 44.—G. L. R., 3207813. 322 Inf., Co. M. Duration: 17 days.

Preoperation note: Patient very restless and noisy and difficult to examine because of poor mental condition.—*Diagnosis:* G. S. W. Forehead just above inner canthus of right eye, four or five minute particles of steel in right frontal lobe and one foreign body 1 x 2 cm. in right occipital lobe (2 X-ray plates at right angles through the courtesy of Capt. G. E. Alleman).—*Operation:* Osteoplastic flap turned down over right occipito-temporo-parietal region, marked oedema of right occipital lobe with an extensive area of softening. Could not locate foreign body by catheter of telephone probe so removed it under the fluorscope. Scalp sutured.—2d day post-operative: Patient still talks a great deal, no temperature. 3d day post-operative: Wound perfectly clean, normal temperature. 8th day post operative: Temperature normal, general condition good, evacuated because told to be in readiness to move.



ONE YEAR'S EXPERIENCE WITH A REGIMENTAL INFIRMARY

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THE last company of the Regiment to which this medical unit was attached reported for active service on June 2, 1917. In the A. E. F., on June 15, 1918, the new and much less cumbersome system of keeping regimental medical records was inaugurated. There was thus a Register of Sick and Wounded for two weeks more than a year and it was considered worth study and analysis. For this purpose, the period from June 15, 1917, to June 14, 1918, both dates inclusive, was selected, as this gave a record of cases for one month in the United States and eleven months overseas.

The Regiment, 11th Engineers, was recruited in New York City during May, 1917, from about 5,000 volunteers, and during the week previous to June 2, 1917, reported by companies to Fort Totten, N. Y., for organization. It was composed of six companies, each of about 185 men and officers, a medical detachment of 25 enlisted men, 1 dental and 3 medical officers, and about 60 men and officers forming the headquarters detachment; 1,201 men sailed from Fort Totten on July 14, 1917. This number fluctuated and fell gradually to 1,120 in April, 1918, when a draft of 410 men was attached making a regimental strength of about 1,530; an average daily strength for the year of 1,255. Loss of regimental strength was due mainly to illness; the attachment of men to other regiments and to the officers' training schools were other factors.

A brief itinerary of the movements of the Regiment for this year is of value. The first month was spent at Fort Totten where all were equipped, vaccinated and immunized against typhoid and para-typhoid fevers, drilled, and given practice marches. There were then twelve days at sea, eight days in a camp in England for gas-mask drill, and nearly six months in the Somme area attached to the British Army. On February 1, 1918, the Regiment was sent to Gievres and distributed in detachments from there to various points in the American S. O. S. On April 1, 1918, it was again attached to the British, at first near Arras, later near Bethune, and June 14, the close of the year found it

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again en route to the S. O. S. All changes were made by rail in the usual freight train.

In all areas the men had hard manual labor and lived under war conditions. When with the British, camps were always within long range shell-fire and bombing, while in the American S. O. S. there were no such disturbing factors.

The Regiment was quartered in tents at Fort Totten, and in France and England during the summer. During October the various detachments acquired hut shelter. On reaching the S. O. S. most were again in huts but one or two companies were in tents, and on going north again in early April, all were in tents.

Water Supply.—In the British areas all water supply was chosen and cared for by corps and army sanitary and engineer troops. It was piped to various "points," each carefully marked with the amount of chlorinated lime necessary to sterilize. There were usually stand pipes for filling water carts, and large tanks of water that had been chlorinated for the use of small units and casualties. Orders for the location of any camp usually included the order for the "point" from which water was to be taken, and all such "points" were carefully marked on the maps supplied.

In the American S. O. S. water supply usually came from some civilian source, was always regarded as contaminated, and it was always advised that it be chlorinated in the strength of 1 gram in 40 gallons. After the care of water was turned over to the regimental medical detachment, the containers washed and aired, and the chlorinating properly done by a carefully instructed enlisted man from the medical detachment, the complaints of chlorin taste in the water were not as common.

Sanitation.—In no area were we assigned to a ready-built camp. All structures for the disposal of wastes were built by the men of the Regiment, under direction of the medical or sanitary officer. As most camps were occupied two weeks or more, the disposal of human waste and of garbage became an important problem, requiring in each camp a good deal of thought and work.

Most of the line officers soon learned that a good job at the outset was labor saving. But, for instance, in digging a latrine, some of them never did learn that the first 2 feet dug are of no use for filling with waste, and that after the first 2 feet, each foot dug is so much labor saved. If a 6-foot latrine is filled to within 2 feet of its top in four weeks time, a 3-foot latrine would be filled to the same mark in one week. To make 3-foot latrines do for four weeks, four would have to be dug, requiring 12 feet of digging. It would seem wise to dig but 6 feet at once. La-

trine pits of the depth of at least 6 feet were recommended, and those deeper care for liquids better. They were covered with a tight box, and seats, with self-closing lids, to accommodate 5 per cent of the men. The seats were scrubbed daily and, when necessary, there were special seats for venereal cases. Pits were not burned out, as oil and straw could not be procured for this purpose. Without the burning they appeared to be perfectly satisfactory, even in summer. Urine was disposed of in covered sumps with one or more funnels.

The disposal of garbage by any other method than incineration was practically impossible. The most satisfactory incinerator used was made of four corrugated iron sheets, standard-sized, the long sides of the sheets being fastened together with heavy wire to make a box open at each end. A hole, 9 inches square, was cut in the middle of the lower end of each side; a grate was made by punching iron angle bars through two opposite sides of the box about 1 foot from the same lower end, and above this, at irregular intervals to the top, were four or five bars to break up the masses thrown in. At the level of, and above the grate, a foot square opening was made, fitted with a flap-door with wire hinges, for starting the fire and raking out the ash. On end, with the grate below, the whole structure made a squatty chimney 6 feet, 6 inches high, and was very efficient in rapidly consuming garbage and in using a small amount of starting fuel. It could be collapsed for transportation. There was another form, used by the British, made of brick somewhat like a small limekiln, with the chimney pipe leading through a small tightly built room which was then used for drying clothing. These were quite successful and very useful in a country like France, where at times it rains for days. No incinerator can be used carelessly. In either of the forms described, garbage must be drained of liquids and be fed to the incinerator slowly. The best results were obtained when two men were detailed regularly from each company and supervised by a sergeant of the medical detachment. With one sheet-iron incinerator, and regularly detailed men, the garbage of 600 men, about four 40-gallon G. I. cans daily, was destroyed in three hours of each morning. After this work is done for several days, men realize that the best way to finish an unpleasant task is to start gradually. In an engineer regiment there are men better suited at these sanitary jobs than with a day's work at trench digging or track laying.

The sumps spoken of were used for fluids only—urine, liquids from garbage, and bath waste. They were pits of appropriate size, usually 6 feet square and 7 or 8 feet deep, filled with broken brick or burned tins, covered with a layer of brush and dirt, and with a pipe leading into the rubble. At the outer end of the pipe there was a simple funnel if the

structure was for urine, or, if used for garbage liquids or bath waste, a trap was necessary to remove the grease and soap, which very soon interfere with drainage efficiency.

During the year, covered by this report, flies were never a problem. In the summer months spent with the British, flies were almost a curiosity, and during the spring months in the American S. O. S., near civilians, the cold prevented them. Meats were, however, hung in safes made of burlap-covered wooden frames, with a tightly closing door of the same construction. This provided free circulation of air and kept away the few flies and other insects. In hot weather the sides of the safe were moistened, the water evaporation cooling the interior.

Within a few days of the arrival of the regiment on the Somme, the medical officers were granted the privilege of visiting the Sanitary School at Peronne and of studying the appliances there. Full-sized models and miniatures of every type of sanitary structure were to be seen, and blueprints showing the detail of construction could be procured. These schools taught not only the theory but the practice and solution of the various sanitary problems which arise in an army. British medical and sanitary corps officers and men were sent to them for short periods of instruction.

The bi-monthly physical examination of enlisted men was carried out regularly and served to pick up an occasional case of venereal disease, or one of lice or scabies, or a man would be found with a badly fitting pair of shoes.

Illnesses.—For the study of disability from disease and accident we have tabulated cases admitted to the Register of Sick and Wounded for the full year.

In two companies the actual attendance at sick call were, for Company B, 3,581, and for Company F, 3,213. Estimating from these figures for the regiment, roughly six and one-half companies, it is found that, for the full year, there were about 22,000 attendances at sick call, a daily average of 60 men.

Of this number 1,026 (4.6 per cent.) were admitted to the register, an average of 2.8 men per day; the remainder, minor injuries, slight colds, constipation, etc., being prescribed for or otherwise treated and returned to duty at once.

Of those admitted to the Register 825 (80.5 per cent) were for disease and 201 (19.5 per cent) for injury. Slightly over one-third of the total number, 37.5 per cent, of these admissions were sent to hospital, 318 (38.5 per cent) of the disease cases, and 67 (33.3 per cent) of the injury cases (Tables 1 and 2).

Regimental Infirmary

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TABLE 1.—Yearly Report of Sick and Wounded

	Rem. last month	Admitted	To be accounted for	To Duty	To Hospital	To hospital and trans- ferred	Remaining quarters	Days lost quarters
June 15-30, '17...	0	33	33	2	28	2	1	24
July 1-13.....	1	26	27	2	22	3	0	10
July 14-31.....	0	5	5	0	3	0	2	34
August.....	2	58	60	38	16	0	6	190
September.....	6	71	77	37	33	1	6	283
October.....	6	53	59	26	19	0	14	242
November.....	14	67	81	38	31	6	6	406
December.....	6	99	105	55	20	4	26	537
January '18.....	26	78	104	59	41	4	0	505
February.....	0	42	42	22	16	0	4	80
March.....	4	58	62	34	25	2	1	154
April.....	1	137	138	87	47	0	4	200
May.....	4	229	233	163	38	1	31	691
June 1-14, '18....	31	70	101	78	22	1	0	362
Totals.....		1,026		641	361	24		3,718
1,026								

TABLE 2.—Classification of Cases on Sick and Wounded Register

	Disease admissions						Injury admissions						
	General disease		Contag. disease		Venereal disease		Injury		Battle wound		Total		
	Qrs.	Hos.	Qrs.	Hos.	Qrs.	Hos.	Qrs.	Hos.	Qrs.	Hos.	Qrs.	Hos.		Total
June 15-30, '17.....	1	29					2	1			3	30	33
July 1-13.....	1	22		1		2					1	25	26
July 14-31.....		3			2						2	3	5
August.....	30	14			3		9	2			42	16	58
September.....	22	14					15	18		2	37	34	71
October.....	20	19					7	2			32	21	53
November.....	16	23			5		8	5	1	9	30	37	67
December.....	59	15			2	4	14	3		2	75	24	99
January '18.....	25	25		1	5	13	5	4			35	42	78
February.....	23	16					2	1			25	17	42
March.....	20	17	1	3	1	?	10	3			32	26	58
April.....	59	25		11	10		15	2	5	10	89	48	137
May.....	165	29		3	3	3	21	2	2	1	191	38	229
June 1-14, '18.....	30	21			1		17	1			47	23	70
Years total.....	471	272	1	20	36	25	125	44	8	24	641	385	1,026
	743		21		61		169		32		1,026		
	825						201						

We obtained the date of return to the regiment, after hospital treatment, of 158 cases. They lost 5,660 days from duty with the regiment, an average of 35.9 days per man.² Twenty-four men, of whom

²We are unable to account entirely for the loss of 35.9 days per man from regimental duty while in hospital. For all cases in the A. E. F. the average stay in hospital was 11.7 days (Weekly Bulletin of the A. E. F. of May 26, 1919, as published in the J. A. M. A., June 14, 1919). Undoubtedly, some time was lost in transfer to and from hospitals. As many of our men were sent to British Hospitals and when well, went to American replacement depots, the time consumed in their return was necessarily lengthened. In addition, it may be that many of the A. E. F. hospital admissions, from more mobile organizations, were for minor surgical cases and mild infectious disease which required but one or two days hospital treatment. As this regiment was an isolated unit, working most of the time far from its own army, we soon learned that, to maintain the regimental strength, it was necessary to treat these mild cases in quarters, and our relative immobility allowed this.

we have record, were reclassified and did not return; eight died in hospital. The longest hospital visit of record was 198 days, a case of pneumonia, the shortest two days, a case of scabies.

The remainder, 641, of the total admitted to the register were treated in quarters and lost 3,718 days from duty, an average per man of 5.8 days. The longest time spent in quarters was 48 days, a case of sciatica that should have been, and later was, sent to hospital. Fifty-four men spent more than two weeks in quarters; 9 of these were venereal cases, 23 were various minor injuries, and 15 were medical cases, mainly bronchitis, and all of which would have been better in hospital.

The 1,026 admissions were distributed among 685 men, or 42.5 per cent of all men who belonged to the regiment at any time. Of this number 450 were admitted once, 162 admitted twice, 49 admitted three times, 20 were admitted four times, 1 was admitted five and 1 six times, and 2 men were admitted seven times. Of the cases of admission four times, 2 were "quitters," 2 were physically incompetent, 4 were venereal cases, 7 had legitimate and different complaints on each admission, and 5 were various chronic affections, one of these being a clear case of ulcer of the stomach which was sent to hospital three times, usually after a hemorrhage. After one of these hospital visits, an American base hospital, where he had what we suppose to have been a two weeks' Lenthartz cure, he was sent back to the regiment with instructions to eat nothing but milk and eggs. The men were then digging trenches, 3 cubic yards of clay being the daily stint of each, milk, when seen, came in a can, and an egg was a rare delicacy. This case is the most glaring example of a small number of men with whom we had to deal, men unable to do full work. It also illustrates how every medical officer must realize that his primary duty is to help keep the military machine moving smoothly, and that as any unit nears the fighting zone such duty becomes paramount, even to the detriment of the sick individual, if necessary. This case of ulcer of the stomach could not be dieted, could do no work, was of no use at all, yet it was necessary to bring up to him daily rations and water, he clogged the roads in trips to and from the hospital, and in any move made by the regiment it was necessary to find for him a place with the baggage.

The classification of causes of admission according to the nomenclature in paragraph 455, M. M. D., 1916, is shown summarized in Table 3.

TABLE 3.—*Causes of Admission to Register of Sick and Wounded*

1	Typhoid fever.....	4
5b	vaccinia.....	7
10	influenza 94, influenza epidemic 133.....	227

19	German measles 2, mumps 20.....	22
19j	trench fever.....	10
28c	tuberculosis pulmonary chronic.....	3
	Pott's dis. 1, Tb. cerv. lymph glands 2.....	3
37	syphilis primary 2, secondary 8.....	10
38A	chancroid 10, chancroidal bubo 1.....	11
38B	gonococcal urethritis 34, epididymitis 6.....	40
47a	rheumatic fever, acute.....	2
55d	purpura.....	2
56b	alcoholism, chronic.....	1
68	paranoia 1, psychasthenia 1, psychosis 1.....	3
69a	epilepsy.....	1
73	trifacial neuralgia 1, sciatic neuritis 3.....	4
74e	neurasthenia 1, shell shock 3.....	4
75A	conjunctivitis acute 2, phlyctenular 2.....	4
75C	amblyopia 2, iritis 1.....	3
76d	otitis media.....	11
79	heart valvular dis. 1, "D. A. H." 1.....	2
83b	hemorrhoids.....	7
84	lymphadenitis 4, lymphangitis 1.....	5
89	bronchitis acute.....	130
91	bronchopneumonia.....	2
92	pneumonia (lobar).....	2
93c	pleurisy acute fibrinous.....	5
98	hemoptysis 1, hay fever 1, rhinitis 2.....	4
100c	tonsillitis acute follicular.....	36
102	ulcer of the stomach.....	5
103	gastritis catarrhal acute 15, chronic 3.....	18
105	colitis 2, enteritis 4, gastroenteritis 36.....	42
108a	appendicitis acute.....	3
109a	hernia inguinal 18, for convalescence 4.....	22
	various minor.....	6
122	pyelitis 1, cystitis 2, prostatitis non-ven. 1.....	4
127c	hydrocele hemorrhagic.....	1
	furuncle 7, abscess 10, cellulitis 25.....	42
145B	scabies.....	60
145Cd	chilblain.....	5
145	various minor skin affections.....	13
146	frontal sinusitis 2, mastoiditis 1.....	3
147	ankylosis 1, arthritis 7.....	8
149	bursitis 5, myositis 18, flat foot 6.....	29
150	congenital malformation, paranasal cyst.....	2
167	burns 2, scald 1.....	3
170	traumatism by firearms.....	32
171	incised wound 10, punctured wound 10.....	20
185	dislocation 2, sprain 42, fracture 21.....	65
186	abrasion 2, concussion 1, contusion 21.....	24
186	contused wound 14, lacerated wound 23.....	37
186	deformity traumatic.....	11
186	ruptured muscle 4, organ spleen 1, tympanum 1.....	6
186	synovitis knee 2, surgical shock 1.....	3

189Ad insomnia.....	1
189Ba under observation.....	2
189Bb malingering.....	1

The general disease group includes 256 cases of infectious disease, 22 of contagious disease, 61 venereals, 2 of disease of the blood, both purpura, 1 fatal, and 1 case of chronic alcoholism.

The 256 cases of infectious disease include 94 cases of what has, in the past, been loosely called influenza, and 133, during the spring epidemic, of what is also called influenza. The 29 remaining cases were 4 of typhoid fever³; 10 of trench fever; 6 of suspected tuberculosis, of which 3 were pulmonary; 7 cases of vaccinia, and 2 of acute rheumatic fever.

Contagious disease was limited to 2 cases of German measles, and 20 of mumps, one man being admitted twice, once for parotid and much later for testicular mumps. The regiment was free of mumps until March, 1918, when it was assigned for a few days to a badly infected camp in the American S. O. S. The 20 cases cost the regiment 830 days' work.

There were 61 admissions for venereal disease distributed amongst 49 men, a morbidity rate of 39 per thousand, which is about the rate given for the A. E. F. Of the 49 men, 34 had gonorrheal urethritis, 8 had syphilis and 7 had chancroid. The only complications were 6 cases of epididymitis in the gonorrheal cases.

Men contracting venereal disease either failed to report for prophylactic treatment, or reported so long after exposure that prevention of infection could not be expected. This delay was usually due to the fact that men were away without leave, intoxicated or on a week-end pass. There was not a single case of infection where preventive treatment had been given less than three hours after exposure. We unfortunately neglected to obtain the record of the number of prophylactic treatments that were given.

We believe it would have been far better to send these men, especially those with chancroid and syphilis, to some venereal center and there have them adequately treated, but were not allowed to do this. As a result a number of men did not have proper treatment at the start, and hospital care was imperative later, with the disease well installed.

³These cases had been immunized 5 months previous to infection. The epidemic of influenza has been reported by one of us,⁴ as has the occurrence of typhoid fever.⁵ It should be noted that influenza occurred in May and June, 1918, before the associated pneumonia caused such a high death rate. Most of these cases were treated satisfactorily in their tents. It is of interest to know that the companies most heavily infected in this epidemic had less of the disease when it again appeared in the regiment in January, 1919.

⁴Bradbury, S., *Amer. Jour. Med. Sc.*, 1918, CTIV, 737.

⁵Bradbury, S., *Jour. A. M. A.*, 1918, 71, 532

There were 12 admissions for organic and functional disease of the nervous system, 7 for disease of the eye, and 11 for ear trouble.

Disease of the circulatory system included 7 cases of hemorrhoids, 1 case of disordered action, and 1 of valvular disease of the heart. There were 4 cases of lymphadenitis, 1 of lymphangitis, all non-venereal.

Acute bronchitis, 130 admissions, was by far the most frequent disease of the respiratory system. There were 2 admissions for acute rhinitis, 2 for lobar and 2 for bronchopneumonia, 5 for acute fibrinous pleurisy, 1 for hay fever, and 1 for hemoptysis, the origin of which was not determined.

In disease of the digestive system, there were 36 admissions for acute follicular tonsillitis. An attempt was made to discover any grouping of these cases, suggesting marked contagion, but no such grouping could be found, and this in spite of the fact that the men were living in such close quarters. There were 5 admissions for ulcer of the stomach, 3 of these being for the one man already spoken of, 15 admissions for acute catarrhal enteritis, 36 for acute gastroenteritis, 18 admissions for hernia, and 3 cases of acute appendicitis, all successfully operated upon.

Hernia was of 1.2 per cent incidence. Fifteen hernias developed, all simple indirect inguinal in type, 10 of which were upon the left side, 4 on the right, and 1 was double. Two of these hernias were recurrent, one having been operated upon previous to enlistment, the other recurring soon after an operation in France. One case developed shortly after enlistment, others developed during the hard manual labor required of the men on reaching the front. None of these hernias could be said to be of true traumatic type. In all, the hernial protusion appeared with little discomfort, no nausea and no ecchymosis, which would be expected in traumatic hernia. Undoubtedly, in all these cases, there had been a congenital sac present, a potential hernia, and the increased strain had forced the abdominal organs into it. The American policy was to operate. The English, however, were fitting trusses to many of their cases, and some of our men were returned from them with trusses. These were found unsatisfactory, and later the men were sent to the hospital for operation. The 15 cases lost 720 days in hospital, an average of 48 days per case, and many, on their return to the regiment, had to be put at some light duty for several weeks. So much time lost may have been one reason why the truss was the British policy.

Of the 120 admissions for disease of the skin and cellular tissue, there were 60 for scabies; 25 for cellulitis, usually in the extremities; 17 for abscess and furuncle; 7 of the abscesses being palmar from the heavy pick and shovel work; 5 cases of chilblain, and 13 various minor skin affections.

Though there is no report of trench foot upon our records, we had several cases of chilblain, some of which gave a history of having had the affection during previous winters.

A typical history of the former condition was that a man had had cold, wet feet and that they had become numb and tingling. On examination the part was red, warm, tender and often slightly swollen. Such conditions cleared up quickly by keeping the feet clean, warm, and dry. We found that rubber boots, when worn for several hours at a time in cold weather, produced this condition, moisture from the feet from perspiration and poor insulation by the rubber causing a much increased heat loss. The British had issued orders against their men wearing rubber boots over extended periods, for they felt that dry woolen socks and properly oiled service boots kept the feet in better condition in cold, wet weather.

It was found almost impossible to effectually treat scabies in the regimental infirmary. It was done but twice with cures and was attempted many times with failure, the soldier being relieved of symptoms for a week or two only.

To obtain a cure meant the following procedure: The patients were given a tent to themselves and their belongings. Two stoves, of any type available, were set up, one outside, on which the clothing was boiled, the other inside to heat the tent. A hospital corps man was assigned to each case, giving his man a complete bath with hot water, green soap, and plenty of rubbing, and then an inunction, from the chin down, with sulphur ointment, the man dressing in his soiled clothes over the ointment. Next day, bath and inunction were repeated, and again the soiled clothing put on. On this day all clothing, except the shoes, was boiled, washed and dried. On the third day bath and inunction were again given and the clothing, washed the previous day, put on. The clothing removed was then boiled, washed and dried, and an attempt was made to sterilize the blankets by steaming in a barrel, with tightly fitting lid, over a pan of boiling water, the "Serbian Barrel," but it was felt that this was the weak point in the whole procedure. Seven days after the third inunction, the whole process was repeated, baths, inunctions, cleaning of the clothing and steaming of the blankets.

Treatment of scabies in those hospitals especially equipped for it was much more easily carried out, and meant the return of the man to the regiment, cured, and with noninfectious clothing and blankets. The hospitals in which sulphur vapor was used seemed to be particularly efficacious and expeditious, though the skins of some did not take kindly to this application of sulphur.

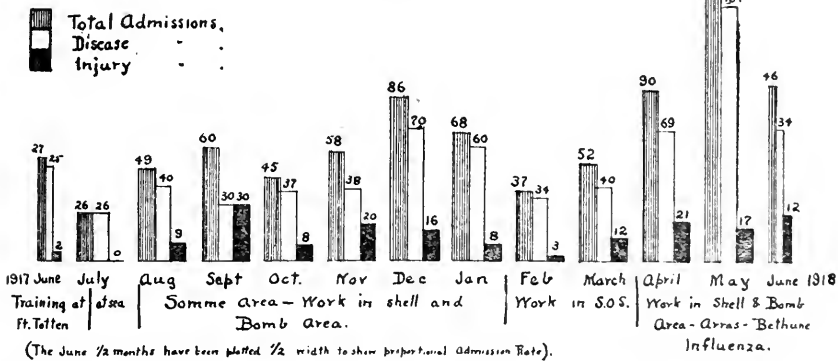
There were a great many cases of pediculosis corporis, but the records

show that but one man was admitted for this reason. The men were often entirely ignorant of what caused the itching and much disgusted when one of the small causes was pointed out. A few hours off duty for a bath and boiling and washing of the clothing sufficed to rid one of these pests. Pediculosis pubis was fairly common, and was treated by clipping or shaving the hair about the affected parts and a liberal use of mercury ointment, or, if this remedy was scarce, a quick sponge with gasoline killed parasites and eggs, though it was very irritating. We have seen this parasite appear on men who had had no opportunity for sexual congress for at least six weeks before its development, and believe it was contracted, in such cases, from latrine seats. No infections by pediculosis capitis were seen.

There were 201 cases of injury, 32 being gunshot wounds, of which 25 were received in action and 7 from accident. The remaining injuries

Figure IV

Numerals represent Admission Rate per thousand strength.



were produced by accidents varying from a collision with a locomotive to one of the most trivial. There were fractures, dislocations, sprains, injuries to the head, chest and abdomen, and to the organs of special sense, besides the usual mild wounds, burns, and contusions seen in civil life.

Injury seemed more frequent than in a similar type of labor in civil life. We think this may be explained by the lack of safeguards, the willingness of the men to take risks they would not take under normal conditions, together with the nervous stress under which all worked. It may be seen from the accompanying Fig. IV, that the injury rate increased each time the regiment was at hard work at the front (not explained by wounds), and that in railway construction in the S. O. S. the number of injuries decreased.

There were 21 fractures, 14 simple and 7 compound. Of the com-

pound fractures, 3 were head injuries, and should be so considered. Six fractures involved the upper extremity, five the lower.

Dislocation accounted for but 2 cases of disability, one being at the shoulder joint, the other a phalanx. Of sprains of joints there were 42, the ankle being involved in 24 instances.

With the exception of gunshot wounds, there was but one intra-abdominal injury, a case of rupture of the spleen occurring in a collision. This man was operated upon by one of us within an hour at a nearby Casualty Clearing Station, the spleen removed, and he reported for duty with the regiment in three months' time.

There were 25 gunshot wounds received in action, of which 4 died almost immediately. Six resulted from machine-gun bullets and others from fragments of high explosive shells and bombs. There were 7 gunshot wounds from accident, 1 a stray machine-gun bullet, the others from explosion of a fuse which the men were taking apart.

During nearly all of this year we had had trouble with a few of the enlisted men who were chronically ill and unfit for service with the regiment. Some were too old to undergo the exposure and hard work, some had chronic ailments rendering them unfit for such work. In April, 1918, we received the order providing for the reclassification of such soldiers by a medical board at the base. Of 14 men referred for such reclassification, 1 was returned as fit for duty, 1 was sent to the United States for discharge, and 12 were assigned to base duty—10 temporarily, 2 permanently. Of those reclassified, 3 had affections of the heart or blood vessels, all men over forty years of age, 4 were deformities due to injury, 1 prior to being drafted, the other 3 contracted in the service, 1 was a mentally and physically underdeveloped and undernourished lad of 20, 2 had flat feet, and 2 had ulcer of the stomach. Of the 13 men given a different classification, 4 were from replacements received three weeks previously.

Deaths.—Eight men were killed in action and are not on the Register of Sick and Wounded. Besides these deaths there were 4 men who died of wounds and 4 who died of disease. This gives a disease mortality of 3.18 per thousand.

The first death occurred before the regiment left Fort Totten and was due to purpura hemorrhagica. The soldier was twenty-five years old, and reported for active duty May 29, an apparently healthy man. He was vaccinated and given the first dose of typhoid bacterin May 30, the first of paratyphoid about June 4, the second of typhoid about June 9. He reported sick, complaining of severe lumbar pain which was at first thought due to the physical exercises. On June 15, he was sent to the Post Hospital because of epistaxis, fever, and continued head and

backache. Later there were hematuria, bloody stools and a swollen knee joint. He died July 3. Two deaths were due to pneumonia, one following a follicular tonsillitis, the other with onset like that of acute bronchitis. The fourth disease death occurred in a soldier forty-two years of age who had never been at sick call. After work one evening he had a convulsion and was sent to the hospital at Nevers at once. There convulsions continued for forty-eight hours and were very severe. The urine was said to be normal, the case diagnosed epilepsy and shortly he developed pneumonia and died.

In conclusion we wish to state that we have attempted to give a résumé of our experience with a regiment in active service. It must be taken into consideration that this report covers a period, June 1917 to June 1918, when the medical service of the American Expeditionary Force was largely in process of formation, and that regulations governing the procedure in certain disabilities had not been issued. We also feel that the long service of the regiment, as an isolated unit attached to the British Expeditionary Force, made our handling of some cases quite irregular.

We have not undertaken criticism of the prescribed methods of sanitation and medical care in the Army because of our decidedly limited viewpoint of the problem as it affects the Army as a whole. However we hope this account may be of value to those with such wider experience, and we feel, therefore, that it has been worth while to place it on record.



THE "SERVICE OF WATER" IN THE FRENCH ARMY

BY LIEUT. COL. S. H. WADHAMS¹

Medical Corps, United States Army

(With one illustration)

ONE of the developments of this war has been the formation in the French Army of a separate bureau of the Engineer Corps known as the "Service of Water." The need for a special organization for this purpose had not apparently been foreseen. The shifting of the battle line of the western front has been accompanied with the pollution and often the destruction of existing sources of water supply. As the war progressed, the procuring of an adequate supply became increasingly difficult not only of potable water for men, but of water for animals.

The real urgency of this question was not appreciated until the summer of 1915 when a large number of men and animals had been concentrated on the Champagne front with the purpose of undertaking certain offensive operations. A very serious shortage in the water supply then developed, so serious in fact that the abandonment of the contemplated offensive seemed to be necessary. In this emergency Major Bunau-Varilla, of the Engineer Corps, was called upon to develop a supply of water. From this beginning has developed the Service of Water of the French Army.

In the beginning it was necessary to improvise most of the equipment required because of the limited material available. These emergency installations have been found to be so entirely successful that their use has been continued. Today these water stations can be seen all along the western front covering a zone from just in rear of the front line trenches to a depth of many miles towards the rear. Many of them are under artillery fire as their visibility makes them good targets. One which I visited has been destroyed four times, but the installation is so simple that it is quickly repaired or replaced.

In view of the experience of the French, this question of water supply has seemed of such importance as to warrant report at this time. While as stated above, this subject, like all others of a technical nature, is placed under the Engineer Corps in the French Army, the Medical Department is charged with the initiation of the necessary measures for rendering the water supply potable, including the required laboratory examinations. As all drinking water must be treated with hypochlorite, it becomes necessary to make frequent examinations and at times to increase the amount of hypochlorite used. There must therefore be a well-equipped laboratory with the necessary transportation (an auto-

¹ Military Observer with the French Armies, May, 1917.

mobile) for the collection of the water samples. It is hardly necessary to add that to procure good results there must be the closest coöperation between these two branches of the service.

This subject naturally divides itself into:

1. The procuring of a water supply and,
2. The sterilization of the water supplied.

Water Supply.—This phase of the question has been very thoroughly discussed by Major Bunau-Varilla both for a stationary army and an army on the move. For the former he concludes that there must be a series of water stations along the rear of such an army where the horse-drawn water carts can be filled for use of the troops at the extreme front. He fixes the place for this series of stations at from six to ten kilometers in the rear. At a closer distance it is sure to draw artillery fire, and farther away the haul for the carts becomes too great.

For a command advancing through a country wanting in water or in which wells and springs have been polluted, he has provided automobile tank wagons which follow up the troops and distribute the water to the horse-drawn water carts. When the position of the Army again becomes fixed, a new series of water stations are constructed at the proper distance from the front.

The sources of supply in the Verdun Army are wells, springs and occasionally streams.

The installation of one of these water stations consists of a small wooden shack which houses the two attendants and the gasoline motor and pump. These motors are usually of the small single-cylinder type and drive a pump of a capacity of 6 to 12 cubic meters per hour. The water is pumped into a tank which is always placed close to a highway.

These tanks deserve a few words of description because of the ingenuity shown in their construction. They are of two types, one a cube holding approximately 1,000 gallons and the other merely a long trough about 16 inches square in section. They were constructed entirely of wood, at first, because that was the only material available, and later because the wooden tanks had proved so satisfactory that there was no need for change. They were made water-tight by coating all joints with a layer of rosin dissolved in any vegetable oil. In some cases a strip of cloth saturated with this mixture was laid in the angles and held by a triangular strip of wood. Small tanks are now constructed of ordinary 1-inch tongue and groove pine. The resin mixture is painted on the tongue and groove as the joints are made. For larger tanks, two layers of the boarding are used and the tanks properly braced on the outside. Even the piping from the source to the tank is sometimes made of boarding because of the lack of metal

pipings. The result is an absolutely water-tight tank. I have inspected a large number, many of which have been in use for more than a year, and I have yet to see one which leaked; moreover they appear to be good for a long time to come.

These overhead tanks are usually connected on either side with a long trough for watering animals. The troughs are made water-tight in the manner described above and a barrier built at the proper distance from the trough prevents animals from getting near enough to damage the trough. There is also provided at each tank one or more hose-pipe connections for filling the water carts conveying the water to the front. An ingenious home-made contrivance permits the driver of the cart to turn on the water by merely pulling a string. Releasing the pull entirely closes the flow from the tank and prevents all dripping and consequent mud around the tank. This whole installation is exceedingly simple, cheaply and quickly constructed and most satisfactory in every way.

Sterilization of the Water.—All sources of water are considered as polluted. As a matter of fact the colon bacillus is present in practically all of them and in some in very large numbers.

The method of purification prescribed by the Minister of War is by treating the water with sodium hypochlorite or Javel solution. For use on such a vast scale, it became necessary to devise some simple and automatic method of adding the Javel solution to the water. Such a method has been invented by Major Bunau-Varilla and is fully described in his report attached. It is very simple, constructed of materials obtainable anywhere and best of all, is absolutely positive in its action, *i.e.*, the pump cannot function if the hypochlorite solution is not supplied. The sole duty of the attendant is to add the hypochlorite to the tank provided for the purpose and failure to do so prevents the pump from working.

As to the amount of hypochlorite required, there seems to be some difference of opinion. The Ministerial Decree on this subject requires that such a quantity of hypochlorite shall be added to the water that one half hour afterward there should be .1 to .2 milligrams of free chlorine per liter. It was found that such a quantity of hypochlorite left a very pronounced taste of chlorine in the water and that men would not use it if any other water could be found. By experiment, Major Bunau-Varilla found that by adding 1 10 milligram of chlorine (from 1 20 to 1 40 of the prescribed quantity) per liter of water, even to a water showing 33,000 bacilli coli per liter, this organism promptly disappeared. This, of course, is true only of a water containing little or no organic matter in suspension.

While the Ministerial Decree has not been modified as a result of these experiments, the use of 1/10 milligrams per liter is permitted and the laboratory reports show that this quantity is sufficient for the sources now used. Of course it is necessary to keep a constant check on each water supply, and this is done by means of the field laboratories so generously supplied in the French Army. At the first indication that the javellization is insufficient, the amount of hypochlorite is increased.

Certainly the results, as measured by the absence of water-borne diseases, are of the best. Moreover the disagreeable taste of chlorine is not present in the water treated as above indicated and men are less apt to drink from unauthorized sources.

Because of the fixed nature of the Western front, the Service of Water has now become a comparatively simple matter. It consists in proper inspection and the keeping in repair of existing stations. Because of the very large number of these stations, a very considerable personnel for this duty is required. In the Verdun sector alone there are 278 of these water stations. The difficulties of the Service of Water begin where there is an advance. Then the problem of water supply in a territory which has been systematically devastated by the enemy becomes serious. Wells are poisoned, streams polluted and springs destroyed.

The Service of Water is organized and prepared for just such an emergency. As stated above, automobile trucks equipped with tanks are provided to follow up the troops and supply them with water from the stations left behind. In the meantime, well-drilling machinery, gasoline motors, pumps, javelling apparatus, and temporary canvas tanks or troughs are ready to be pushed to the front to establish new water stations. I have seen one such station which was erected complete in 4 hours and 35 minutes. These canvas troughs appear to answer this purpose admirably inasmuch as they can be prepared in advance and very rapidly erected.

One other precaution worthy of note in this connection is the adoption and issue by the French of a tiny glass ampoule of hypochlorite to each soldier. The quantity is sufficient to sterilize a canteen full of water and is an additional effort to protect the soldier when an advance takes place. Whether this method of solving this question offers any advantages over the water bag which now forms part of our equipment is a question which only experience can decide. I am inclined to think that the ampoules might be employed in conjunction with the water bag to good advantage.

I am particularly impressed with two features of their equipment: first, the simple distributing tanks and second, the appliance for auto-

matically javellizing the water furnished. For this reason I have translated the report of Major Bunau-Varilla and attached it hereto.

[TRANSLATION]

SERVICE OF WATER, 2D ARMY²

Report of MAJOR BUNAU-VARILLA, Engineer Corps, Chief of the Service of Water of the 2d Army on the subject of *Measures Adopted for the Simple and Practical Purification of Water for Drinking Purposes.*

PART I

The prescribed javellization of water and its inconveniences.—The method of purification prescribed at present is defined in instructions dated Grand General Staff, February 14, 1916 and signed P. O. for the Major General.

The following paragraphs found in this document outline this method precisely.

THE REQUIRED QUANTITY OF HYPOCHLORITE NECESSARY FOR STERILIZATION

It is recalled that conformable to the instructions contained in the letter No 4690/S of September 25, 1915, from the Director General of the Sanitary Service the quantity of hypochlorite necessary for assuring the sterilization of a water is a variable quantity depending on the chlorine content of the sterilizing fluid used and the nature of the water to be treated. This quantity must be such that a half hour after contact there remains still in the water treated traces of free chlorine, but only traces, that is to say .1 to .2 milligram of free chlorine per liter.

Pharmacists must assure themselves by frequent experiments (using the colorimetric method based on the employment of iodide of potassium and amidon) that this condition is in fact realized. Moreover, and according to the wording of the same instructions, it is necessary in order that there may remain a trace of free chlorine to employ an initial quantity of hypochlorite such as will correspond approximately to: 4, 3, 2, or 1 milligram of free chlorine per liter according as the water treated is very polluted, muddy, partially clear or clear. The chlorine content of hypochlorite employed being extremely variable, it is important that it should always be determined by the laboratory and frequently verified.

The inconveniences of this method outlined above are immediately apparent. It implies the obligations:

1. To have constant recourse to chemistry to determine the free chlorine content of the hypochlorite solution employed.
2. To have constant recourse to chemistry to determine, being given the free chlorine content of the hypochlorite solution, what quantity of this solution it is necessary to add to each liter of water in order to obtain a javellization of 1, 2, 3, or 4 milligrams of free chlorine per liter of water according to the degree of turbidity existing in this water.
3. To have constant recourse to chemistry in order to determine if after a half hour's contact there remains free chlorine and that the

² Because of insufficient time, I have been unable to make a translation of the entire report. I have, however, extracted the essential features.

quantity remaining does not exceed $1/10$ to $2/10$ of a milligram of free chlorine per liter.

4. To require that men must drink a water charged with chemical products apparent to the taste under the pretext of preserving them from a danger for which they have already been required to submit to injections of typhoid vaccine.

It is a common observation in the territory of the 2d Army, that a rain more or less abundant suddenly causes a source of supply to change from a state of limpidity to one containing more or less sediment in suspension. It results from this, that according to meteorological conditions one must change the amount of free chlorine added from 1 to 2 or 3 milligrams per liter, in order to obey the instructions quoted above. But on the other hand this method requires that there shall remain at the end of a half hour $1/10$ to $2/10$ milligrams of free chlorine and that this amount shall not be exceeded.

These two conditions are in fact incompatible in the majority of cases, for the deposit of mineral substances producing the sediment in the water does not measure exactly the quantity of organic matter which is to be attacked by the chlorine. Without going further into this incompatibility of the two conditions imposed, it will suffice to consider first, the large number of sources of supply; next, the constant and sudden variations in the factors which the chemist must determine; and finally, the time which will be required to make these analyses in order to conclude that the task which devolves upon the laboratory is one which cannot be successfully performed under existing conditions. If this program is difficult for a stationary army, how much more difficult it would be for a moving army can be readily imagined.

The result of all regulation not adapted to actual conditions, is that only the easiest are put into effect. The existence of free hypochlorite in the water after treatment can be easily verified. The tendency then in following the prescribed regulations is towards the addition of an excess of the hypochlorite. The result has been to develop a strong antagonism on the part of enlisted men against the water treated in this way. Javellization has become extremely unpopular. It can be said that men submit to the use of this water through discipline when it ought to be received as a benefit and a protection.

PART II

This part of Major Bunau-Varilla's report details his experiments with very much reduced doses of hypochlorite. He found that $1/10$ milligram of free chlorine added to a water containing as many as 33,000 bacilli coli per liter caused the organism to disappear. This dose is from a $1/10$ to $1/40$ of the dose required by regulations.

PART III

The instantaneous action of hypochlorite in reduced doses.—In this part of the report, Major Bunau-Varilla shows that the action of the hypochlorite on the colon bacillus is almost instantaneous even in the very weak dose employed. He has shown that water containing large numbers of colon bacilli when drawn into the pump and there mixed with hypochlorite in the proportion of 1/10 milligram of free chlorine per liter, is free of colon bacilli when delivered at the end of the supply pipe 12 meters distant.

PART IV

Limit of action of the hypochlorite in very much reduced dosage.—Numerous experiments are detailed in the sterilization of water using exceedingly small dosage of the hypochlorite. These may be summarized by the statement that the sterilization becomes incomplete with .005 to .01 milligram of free chlorine to the liter but that with .02 milligrams of free chlorine per liter of water treated, the sterilization becomes effective. In other words, while .02 milligrams of free chlorine was sufficient to sterilize the waters experimented with, the fixed dosage of free chlorine has been fixed at five times this figure or .1 milligram of free chlorine in order to provide a margin of safety. This margin also guards against deterioration of the hypochlorite solution used.

The writer of the report wishes it distinctly understood that he believes these experiments should be repeated before being considered as conclusive.

PART V

Apparatus assuring the automatic javellization of pumped water.—The greatest difficulty which one encounters in the javellization of water pumped from its source, is in the necessity of depending on a human agent to open or close faucets at the proper time. Absence, sickness, neglect or forgetfulness are the constant difficulties against which one must struggle.

If one depends on javellization and the apparatus supplying it can fail without its being known the system becomes more dangerous than if none at all existed. All apparatus for javellization ought to be absolutely automatic and so arranged that the pump will not deliver water if the Javel is not being supplied. The two difficulties in realizing this ideal have been: first, that after stopping the pump aspiration draws into the source a considerable quantity of the hypochlorite if a cutoff

faucet is not closed, and second, after starting the pump there is no hypochlorite supplied unless the faucet is opened.

The system described below removes these two difficulties:

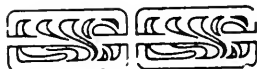
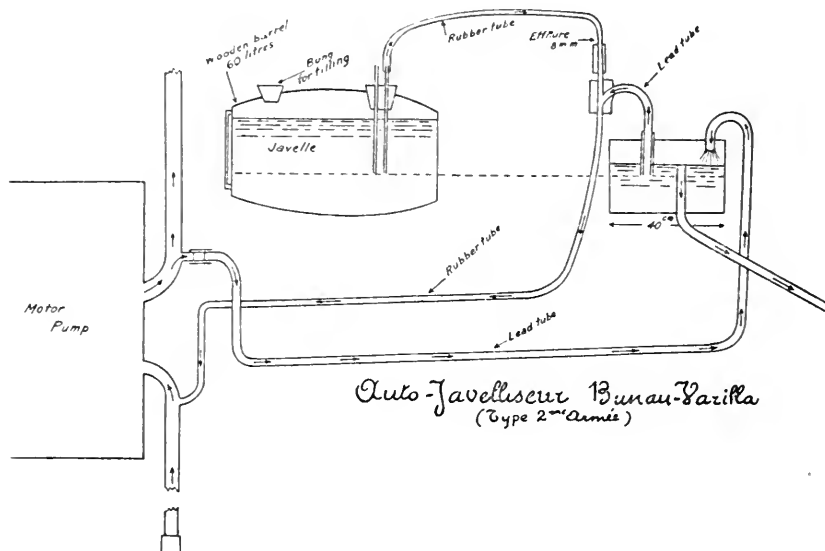
A rubber tube connects the intake pipe of the pump with a bifurcated tube, one branch of which ends in a small keg containing the hypochlorite and the other in a reservoir for water supplied from the delivery pipe of the pump. In the rubber tube to the hypochlorite container is an "effilure" or short piece of glass tubing drawn out to a fine point. This limits the amount of hypochlorite which can be delivered when the pump is in operation. The suction tube in the reservoir assures the immediate cessation of delivery of hypochlorite when the pump stops. If the attendant forgets to fill the hypochlorite container, or if it becomes empty, the pump will aspirate air. It will cease pumping if it is a centrifugal pump, and it will deliver a very much reduced volume if it is a piston pump. In either case, trouble is produced which will advise the attendant in charge that something is wrong. The pump cannot work without a supply of Javel in the container and no javellization can take place when the pump is not working.

The apparatus is very simple and does not require a faucet or valve or any other mechanism subject to wear and corrosion. The calculation of the strength of the hypochlorite solution to be placed in the container is very simple. The standard Javel solution contains 50 grams of free chlorine to the liter. Two grams of this solution would therefore be the amount required by a cubic meter of water to furnish 1/10 milligram of chlorine to the liter. Then if N represents the number of cubic meters delivered by the pump per hour, $2 \times N$ would equal the number of grams of Javel solution which it would be necessary to add to furnish 1/10 milligram of chlorine per liter.

If the "effilure" or tapered glass tube delivers n liters per hour, the strength of the hypochlorite solution is determined by the simple formula of $2 \times \frac{N}{n}$. In other words, in order to make up the solution of

hypochlorite, it will be necessary to add $2 \times \frac{N}{n}$ cubic centimeters of Javel to the liter of water. Practically this is done by determining big N and little n for each pump and each "effilure." A bucket holding ten liters of water is supplied and an ordinary drinking glass has marked with a file the point to which it should be filled with the Standard Javel solution. This amount of Javel added to the 10 liters of water produces the proper dilution for the particular pump so that for each liter of water delivered by the pump, 1/10 of a milligram of free chlorine has been added.

The attached diagram represents diagrammatically the principle upon which this apparatus works. It is exceedingly simple, positive in action and there is no complicated apparatus to get out of order.



PLASTIC REPAIR OF SOFT TISSUE INJURIES OF THE FACE¹

By J. D. WHITHAM, M. D.

Formerly Lieutenant Colonel, Medical Corps, U. S. Army

(With twenty-five illustrations)

BECAUSE of its vascularity and freedom from likelihood of infection, the face is by far the most favorable part of the body for plastic operations. In the early treatment of face injuries, the surgeon must be on the lookout for the following complications: hemorrhage, cellulitis, edema of the larynx, dysphagia and lung infections. Feeding is rarely very difficult, even in extensive face injuries, and the esophageal tube is seldom needed. Cleanliness of the parts involved, must be thorough from the beginning. Painstaking removal of all dirt and foreign bodies by washing and the use of forceps should be practiced, and the use of Dakin's solution whenever infection is present, is advisable. Every effort must be made to save every scrap of tissue possible, even though it is not practicable to suture damaged structures in their original positions. Primary suture is usually advisable, but in extensive war wounds it is often not best to attempt it. Wounds should be carefully sewed in layers, making ample provision in extensive injuries for drainage and using relaxation sutures when indicated to relieve tension on the wound edges. To prevent the relaxation sutures cutting through the soft tissues, they may be tied over small vulcanite or bone buttons, or over small pieces of rubber tubing.

Drooping injured parts may be satisfactorily supported by a careful arrangement of bandages and dressings, which can often be effected by means of dressmaker's hooks fastened to adhesive plaster strips. The strips are placed on the healthy skin on both sides of the wound, and the drooping parts held up by connecting the hooks with small elastic rubber bands. The mouth and nasal cavities when involved, must receive from the beginning the most careful attention. After wounds have healed over an ample time must elapse, especially in war wounds, before the late and final operations are begun. During this period much can be accomplished by massage, *i. e.*, punching, pinching and rubbing the parts. Radiotherapy is useful in extensive scars. The surgeon must postpone operations until he feels sure that scar contraction has ceased, that the nutrition of the parts has improved sufficiently, and that no infection is latent in the wound. To avoid operating too early will save many regrets.

¹ Read at meeting of American Medical Association, New Orleans, La., April, 1920.

Scars are usually treated by excision, the incisions extending into healthy skin on either side. I know of no suture material more satisfactory than dermol and use interrupted stitches placed with ophthalmic needles. In cases in which there is no tension on the wound edges, I remove half the stitches on the second day and the remainder on the fourth day. In this way, scars from stitch wounds are almost unknown. Extensive scars of the face may be treated by excision and covering by the sliding of adjacent flaps. Such a method necessitates extensive undercutting of the skin, tension sutures and often relaxation incisions. Pedicled grafts from the chest can be used satisfactorily in such cases, and I believe that the tubed pedicle method, described by Gillies, is the only safe way of handling very extensive cases of facial scars such as follow large burns.

Large Krause-Wolf grafts are uncertain when used on the movable parts of the face, but can be used on the forehead and nose with assurance of success. Depressed scars may be improved by careful excision, undercutting of the skin edges and turning into the depression small pedicled subcutaneous fat flaps borrowed from the neighborhood of the wound. Such flaps are sutured together with fine catgut and the skin accurately approximated with fine, closely placed, interrupted dermol sutures (Figs. 1-2). The platysma muscle with overlying fat can often be utilized to fill in depressions in the mandibular region. In extensive depressed scars in the malar and zygomatic region, the temporal muscle can be split and used to fill in the defect. This is done by extensive undercutting of the skin through incisions over the muscle separating a portion of the muscle from its origin and pulling it downward and forward through the undermined skin into the defect. (Diag. 1)

Free fat is very useful in many cases of depressed scars, and is successful in a surprising number of instances. I prefer fat alone to fat and fascia. It is most readily obtained from the subcutaneous tissue of the abdomen. It is advisable, I believe, to insert a piece somewhat oversized, to allow for subsequent absorption and shrinkage.

Cartilage is sometimes of value in the obliteration of depressions in the face, especially about the forehead, eyelids, nose, malar and zygomatic regions. In the malar and zygomatic regions, my preference is for tibial bone-grafts. These I cut about $\frac{1}{4}$ inch thick, being careful to include the periosteum intact. When possible, they should be in contact with freshened bone throughout the greater part of their length. By means of a dental engine and small burrs, a very accurate fit may be obtained for such a graft in the malar and zygomatic regions, and the graft firmly wedged into position.

A lost orbital margin and even a portion of the floor of the orbit,

can be very neatly replaced in this way, and I believe with considerable assurance of permanency (Figs. 3-4).

The writer has had no experience with the use of foreign bodies in facial restorations as substitutes for the bony substructure. How simple many of the problems of plastic surgery would be, if this could be done without danger of surgical complications! Gillies and Aymard, whose experiences in facial work have been enormous, abandoned the use of foreign bodies after many months of trial. I have taken foreign bodies out of the face, but have never put any in.

There are, in general, three methods of reconstructing a nose, viz., *First*—The Indian method, in which a flap is taken from the forehead and brought down on a pedicle. *Second*—The French method, in which the loss is replaced by undercutting and sliding adjacent skin, and last, the Italian method, in which a flap is taken from some other part of the body. The last two methods not being so generally useful, will not be discussed in this paper. The Indian method is to be preferred in all cases in which the loss is extensive, because of the great viability of the forehead flap, and because of the similarity in appearance of the forehead skin to the skin of the nose.

The best method of performing a complete rhinoplasty, is believed to be a modification of the Keegan operation, performed in brief, as follows: Three pieces of costal cartilage are obtained from the patient, one about $2\frac{1}{2}$ inches by $\frac{1}{2}$ inch by $\frac{3}{4}$ inch, and two pieces each about 1 inch by $\frac{3}{4}$ inch by $\frac{1}{4}$ inch. These are implanted beneath the skin of the forehead and cheek. After six to eight weeks, if the cartilages have not undergone any absorption, the rhinoplasty is performed. Quadrilateral flaps are cut on each side and above the nasal orifice. These are turned in with cartilages attached to form the supports and the skin edges are sutured, making the lining complete. A large forehead flap is then cut exactly to pattern and brought down to form a covering for the nose. An extension must be made at the tip of this flap to form the new columna nasi, this being sutured to a corresponding flap which is cut on the upper lip and turned up to meet it. The forehead defect is then closed as far as possible by undercutting the scalp and suture, and completed by the stitching into place of a tightly fitting Krause-Wolf graft. The result depends on the degree of perfection obtained in providing a good, non-shrinkable skin lining, and on the formation of a good tripod of cartilage for nasal support. Following the operation, large rubber tubes should be inserted in each nostril, followed later by specially made intra-nasal conformers attached to an upper encapping dental splint. After four weeks, the pedicled flap may be returned to the forehead, and after six weeks, the retouching operations begun (Diag. 2, a, b, c, d, e).

The operation for total loss of the nose, which the writer has seen practiced by Professor Sibileau, of Paris, is especially useful, I think, in patients past middle age, when the loss is due to lupus or syphilis. His method is to turn back a forehead flap, implant next to the periosteum under the flap, three strips of tibial bone, including the periosteum, and resuture the forehead flap in its original bed. After two weeks, he brings down the forehead flap with the bone grafts on its deep surface, and trimming it to fit properly, he sutures it in place. The nose is thus formed without epithelial lining, and for this reason, is liable to subsequent shrinkage (Diag. 3).

When the nasal loss is not complete, the choice of operation is most difficult, as no two cases are alike in all respects. I shall describe a method I saw used by Doctor Lemaitre in cases in which the lower third of the nose was completely lost. He makes a horizontal incision across the nose about 2 cm. above the wound, extending into the nasal cavity. He then sutures skin to mucous membranes above and below the opening thus made, leaving no raw surface. The portion of the nose thus separated above is then trained downward by means of small, specially constructed metal tubes, somewhat resembling Kyle's intra-nasal splints. These are worn for many weeks. At this time he also implants vertically in the forehead under the skin, a tibial osteoperiosteal graft about 0.5 cm. thick. After several weeks the skin of the cheek is turned inward and sutured to the nasal mucous membrane to form a lining for the middle third of the nose, and at the same time the forehead flap containing the graft is brought down, having in its pedicle the anterior branch of the superficial temporal artery. The ends of the graft, which project above and below the flap, are tucked under the skin of the nose above and below the gap to be covered, thus forming a bony bridge support for the reconstructed nose. Some excellent results can be obtained by this method, especially in the type of injury so often seen in the recent war, in which the cheek and lower lid on one side were injured by the same projectile which destroyed a portion of the nose.

When the loss is in the middle third of the nose and there is no injury to cheek or eyelid that needs extensive replacement, it is best, I think, to reform the mucous lining of the nose, which has been lost, by turning down a skin flap from the nose above the wound and to cover the whole with a cartilage bearing forehead flap (Diag. 4, *a, b, c, d*).

When the loss is not too great, the covering may be obtained by a pull-down or sliding down of the forehead skin. This method consists of making an inverted V-incision in the forehead, the limbs of which

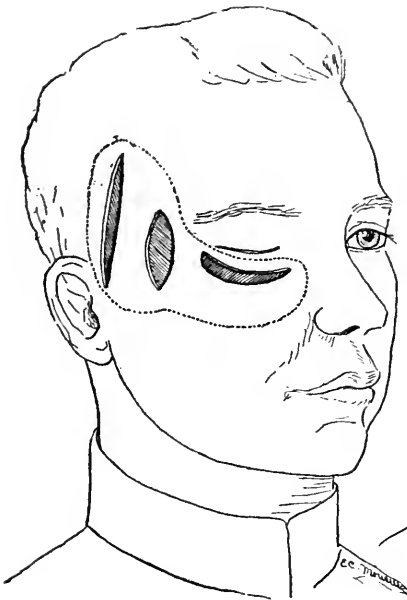


PLATE I

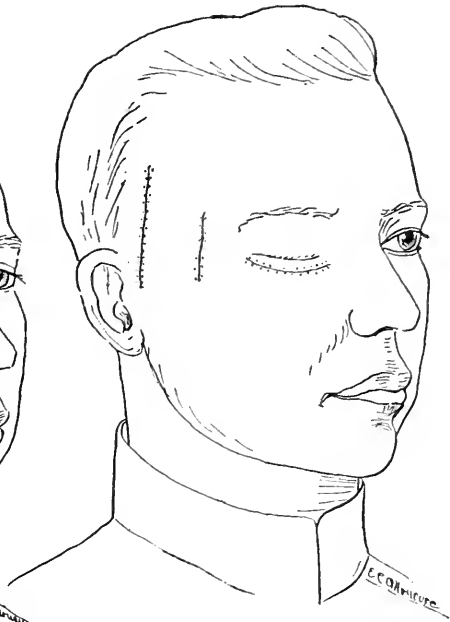


PLATE II

DIAGRAM 1

The incisions shown in the diagram permit access to the temporal muscle when it is desired to shift a portion of it to replace defects and fill depressions in the lamar region.

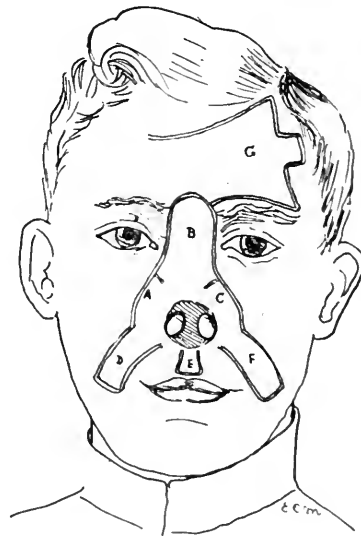
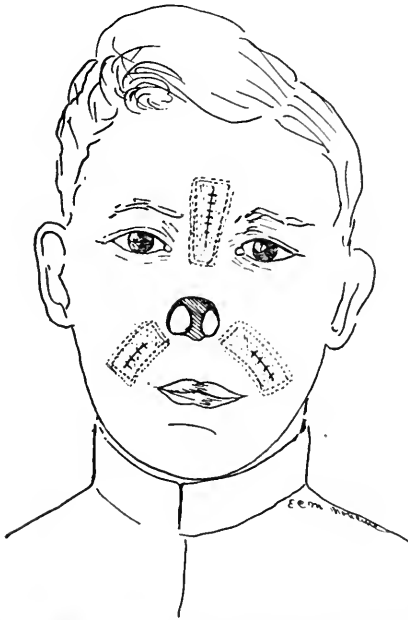
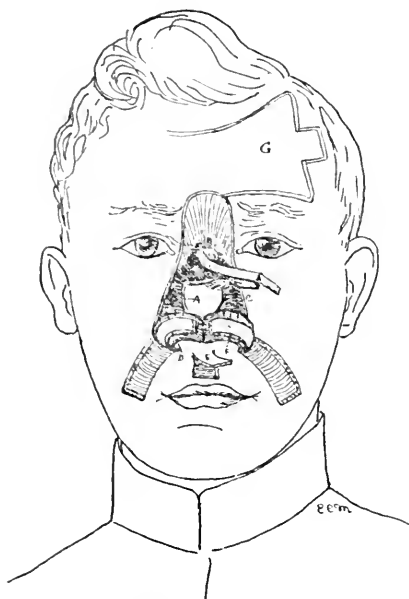


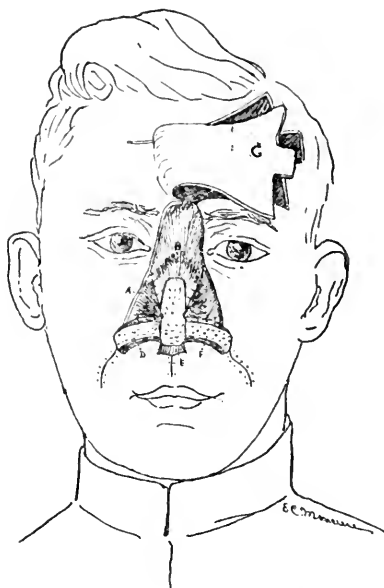
DIAGRAM 2

(a) Total rhinoplasty by Indian method; each of the three stippled areas indicate the sites for cartilage implants.

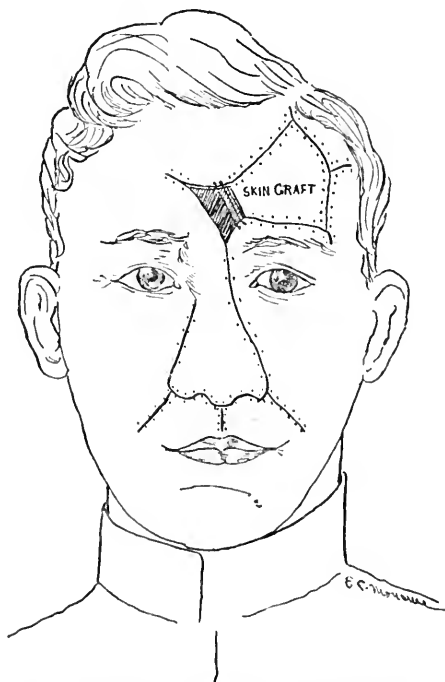
(b) Several weeks later the flaps are outlined as shown



(c) Cartilage bearing flaps are raised, turned on their pedicles and used to form a lining for the new nose.



(d) Flaps sutured in place completing the nasal lining and forehead flap raised.



(e) Nose covered by forehead flap and forehead defect replaced by a Krause-Wolf graft.

PLATE I

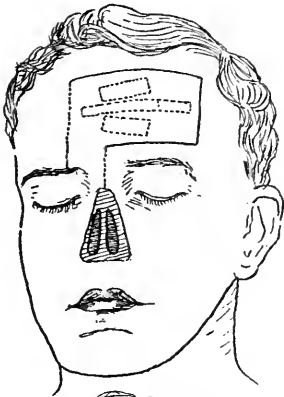
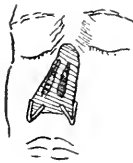


PLATE V



AT II

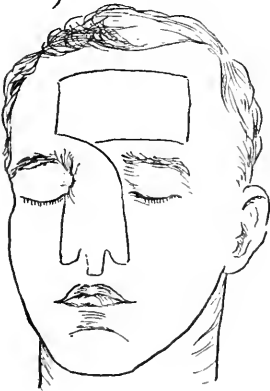
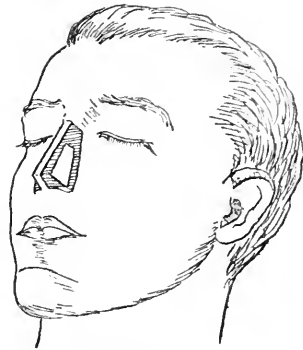


PLATE III

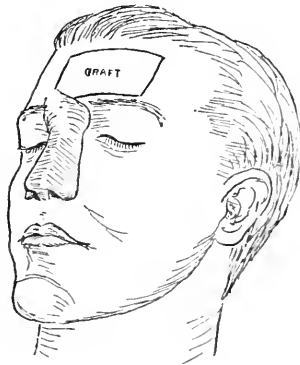
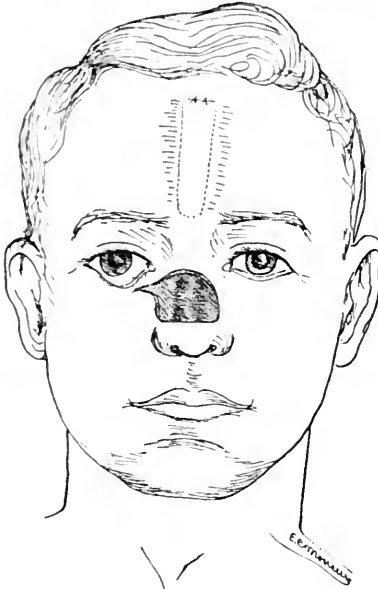


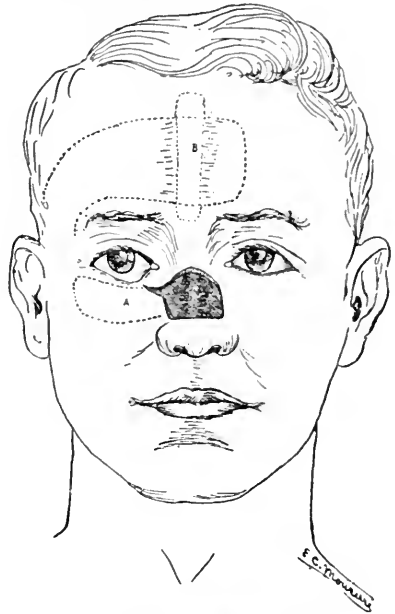
PLATE IV

DIAGRAM 3.—Rhinoplasty described by Dr. Sibileau. For description see the text.

DIAGRAM 4.—Rhinoplasty described by Dr. Lemaitre.



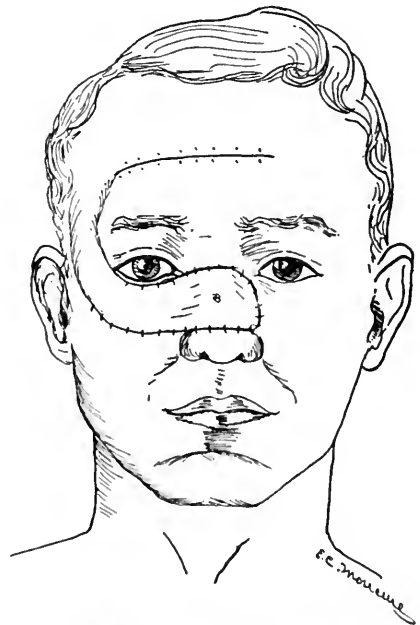
(a) Osteo-periosteal tibial graft inserted under skin in center of forehead. This is done several weeks before the rhinoplasty.



(b) The skin flaps outlined.



(c) The cheek flap is turned in and sutured to nasal mucous membrane to complete the lining of the nose and the forehead flap with bone-graft attached is brought down. The projecting ends of the graft are slipped under the skin of the nose above and below the defect.



(d) Forehead flap sutured in place and forehead defect closed by undercutting of scalp and suture.



FIG. 1.—Depressed scar of cheek following gun-shot injury.



FIG. 2.—Case illustrated in Fig. 1 after scar excision and suturing into the depression two small subcutaneous fat flaps.



FIG. 3.—Gun-shot injury destroying a large portion of the floor of the orbit and malar bone.
(To face page 72.)



FIG. 4.—Case shown in Fig. 3 after insertion of a large tibial bone graft inlaid into zygoma.

FIG. 5.—Gun-shot injury which destroyed a large part of the malar bone and zygomatic process.

FIG. 6.—Case illustrated in Fig. 5 after inlaying a large tibial bone graft.



FIG. 7.—Haemangioma of upper lip.



FIG. 8.—Case shown in Fig. 7 after operation. The slight notch in lip will be removed at a later date.



FIG. 9.—Gun-shot wound which caused the loss of all the upper teeth, a large portion of the superior maxilla, upper lip, cartilaginous and bony nasal septum and columna_nasi.



FIG. 10.—Same case as Fig. 9. Patient with prosthesis in place. Lip will be improved and columna_nasi will be constructed at a later date. A considerable part of the substance of the new upper lip was made by Major Schaeffer by means of a double pedicled flap from the scalp at the vertex. The skin covering as shown was provided by the writer by a pedicled flap.

are near the inner border of the eyebrows and the apex near the hair line of the forehead directly above. Through this incision the skin of the nose and forehead is undercut. This skin is then pulled down to cover the defect on the nose and the forehead incision closed as an inverted Y. A piece of rib cartilage may be previously implanted in the upper part of the nose and forehead, and brought down with the sliding flap when indicated, to restore the nasal framework. The disadvantages of this method are the peculiar curved shape usually given the nose and the conspicuous distortion of the skin in the region between the eyebrows. There are many special methods of nasal advancement which have been devised recently. Lack of space does not permit of their description in this paper.

Probably the best method of replacing an extensive loss of one ala is by turning up a flap from the nasolabial region as a lining and covering this with a good-sized frontal flap. A small piece of cartilage may be implanted in the cheek flap beforehand, to give support. For this purpose, the cartilage may be obtained from the ear.

I wish to emphasize the importance of furnishing the reconstructed nose with a complete lining of mucous membrane or skin. This I do not believe can be done by Thiersch grafting of the flap, either before it is brought down, or afterwards.

An eyelid when completely destroyed is so difficult of satisfactory restoration, that the subjecting of the patient to the long series of operations necessary, is not often justifiable. In a matter of this kind, as is so often the case in cosmetic surgery, the mental attitude of the patient is the deciding factor. I have never seen a patient with a loss of muscle power in the upper lid, who cared to wear an uncovered artificial eye. Eyelids are best restored by temporal or supraorbital flaps, which must be made overlarge, as subsequent shrinkage is great. Previous skin-grafting of the under surfaces of the flap is not in general, so satisfactory as doubling the flap on itself, or in some other measure providing a true skin surface to the eye-socket side of the flap. In any case, the new lid should be stitched to its fellow and so held for many weeks, and a small mould of the eye-socket should be constantly left in place to prevent the loss of the socket through shrinkage. This mould can be made in two or three pieces which will permit of withdrawal, irrigation of socket and re-introduction through a small opening between the lids. Small bits of cartilage obtained from the ear or ribs, are useful in stiffening and supporting a reconstructed lid. Severe cicatricial ectropion of the lids may be treated by large pedicled flaps from the temporal or supraorbital region or from the cheek or side of the nose.

The skin grafting outlay method of Gillies is very useful, especially in defects of the upper lid. Ectropion of the lower lid, unless of extreme degree, can usually be treated satisfactorily by a Wharton-Jones V-Y, or similar operation. The method of correcting a cicatricial ectropion employed by Doctor Ferdinand Lemaitre, is an excellent one. He carefully excises all scar tissue on the affected lid, undermines the skin of the lid until it can be stretched well over its fellow; freshens the margins of each lid by trimming with knife and scissor; sutures the lid together and fills in the defect with a thinly cut Krause graft which he sutures in place with silk. At the end of about six weeks he cuts the adhesion between the lids.

Eyebrows have been successfully replaced by free graft. The scalp just behind the mastoid, is very suitable for this purpose. The hairs of the uninjured eyebrow have been carefully combed into upper and lower halves, and one of these halves removed and sutured as a free graft to replace a lost eyebrow.

I believe that in a large measure, the smaller operations in facial plastic surgery are much more difficult than the larger ones. It is in the handling of small flaps and in the finishing operations that the surgeon's ability is put to the test. This is true indeed in the reconstruction of eyelids and of eye-sockets. The contracted eye-socket is only to be reconstructed, I believe, by pedicled skin flaps. I have used little moulds covered with Thiersch graft, time and again, and have almost invariably seen the socket which at first seemed so good, shrink back after a few weeks, to its original condition.

Before attempting the reconstruction of a lip, it is essential that the bony substructure, if lost, be replaced by prosthesis, as it is only in this way that an extreme degree of shrinkage and a wretched result can be avoided.

When mucous cavities are involved, it is essential to cosmetic and functional success, to provide an epithelial lining as well as a suitable skin covering. A reconstructed nose without proper epithelial lining will soon lose its form when shrinkage of the interior begins, and a wretched result will be obtained from a cosmetic and functional point of view. Improper drainage of the nasal sinuses, obstructed respiration or a sunken nasal bridge will follow what appeared at first to be an excellent result.

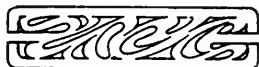
External appliances to correct deformities are most useful. In this way, the sagging of tissues can be prevented, the tissues can be supported during the healing of wounds and scar contractions limited. The most useful and best appliance is that which obtains its support from an encapping dental splint of the upper jaw. Such an appliance

I have found useful to maintain the correct position of a nose after refracturing it for the correction of a deformity.

In repairing cheek defects, pedicled flaps are the last resort, and are only necessary in cases of extensive loss. Here, as in the case of eyelid or nose reconstruction, the provision of an adequate lining of skin or mucous membrane is of the greatest importance. This is best obtained in extensive cases, by the inversion of neighboring skin.

In conclusion, I wish to express the hope that I have not sacrificed too much clearness for the sake of brevity in dealing with such a broad subject.

570 PARK AVENUE
New York



A MEDICAL HISTORY OF GENERAL ZACHARY TAYLOR'S ARMY OF OCCUPATION IN TEXAS AND MEXICO, 1845-1847

BY LIEUTENANT COLONEL LOUIS C. DUNCAN

Medical Corps, United States Army

(With six illustrations)

NOTE.—The principal part of the medical history to be found in these articles is derived from a series of memoirs by Surgeon John B. Porter, U. S. Army: "Medical and Surgical Notes of Campaigns in the War with Mexico during the years 1845, 1846, 1847, and 1848." Dr. Porter was appointed assistant surgeon (from Connecticut) December 1, 1833, and surgeon October 4, 1846. He was retired August 27, 1862, and died June 15, 1869.

THE ARMY ASSEMBLED

WHEN Texas won her freedom from Mexico in 1836 and became an independent State, the boundary line between the two Republics was not definitely established. When later, in 1845, Texas entered the Federal Union, this boundary dispute and other sources of irritation led to war between the United States and Mexico. The war thus begun, in 1846, continued until 1848. The first conflict of arms naturally took place in the disputed territory, between the rivers Neuces and Rio Grande, when in the spring of 1845 our Government sent troops to occupy this strip of territory.

In 1844 Col. Zachary Taylor (brevet brigadier general) of the 6th Infantry had some 1,200 men at Fort Jesup, La., and Colonel Arbuckle had 750 more on the Arkansas River, all assembled on account of the Texas imbroglio. In February, 1845, Congress voted to admit Texas into the Union, but Texas itself delayed action and did not accept statehood until July 4, 1845.

On June 15 General Taylor was ordered to advance to the Sabine River, the boundary between the United States and Texas, but a little later this destination was changed to a point on the Gulf coast much farther to the south.

Early in July the 3d and 4th Infantry embarked at New Orleans, while the cavalry, seven companies of the 2d Dragoons, marched overland. By August 1 the infantry and some batteries of the new Army had arrived at their destination, Corpus Christi. A little later the 7th Infantry arrived, with other troops, and on the 27th of August the dragoons rode into the camp. In a short time seven of the (then) eight infantry regiments of the Army were assembled and more than one-half of all the Regular troops of the Nation. Except a few Texans, no volunteers had yet arrived.

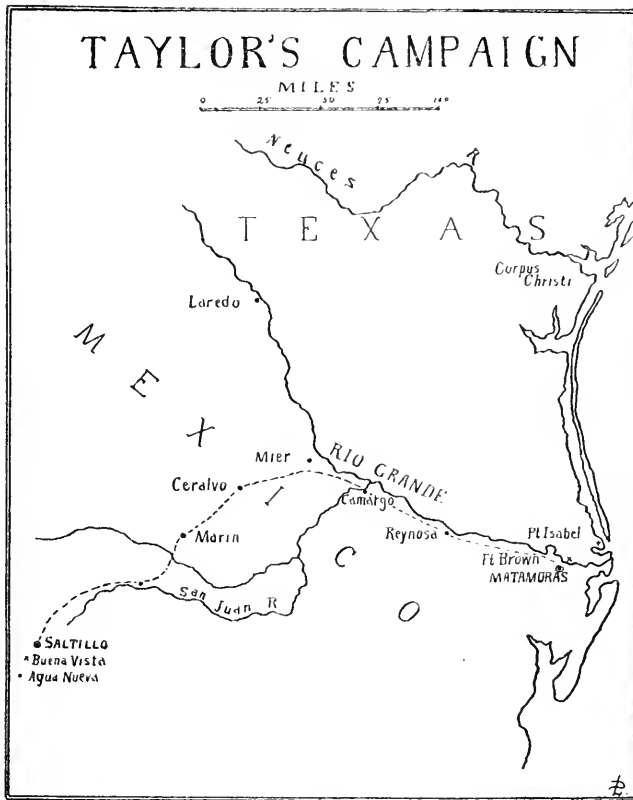


FIG. 1.

By September the Army was in camp on the ground about Corpus Christi, in the following order:

- 2d Dragoons, seven companies.
- 1st Brigade, on right, General Worth.
 - 8th Infantry.
 - 11 companies of artillery, as infantry.
 - Duncan's battery.
- 2d Brigade, in center, Lieutenant Colonel McIntosh.
 - 5th Infantry.
 - 7th Infantry.
 - 4 companies of horse artillery(?)
- 3d Brigade, on left, Colonel Whistler.
 - 3d Infantry.
 - 4th Infantry.
 - 2 companies volunteer artillery.

The total strength was 3,554 officers and men, equal to one modern infantry regiment.

The principal medical officer of the army was Surgeon Presley H. Craig, U. S. Army. Dr. Craig was appointed surgeon's mate of the 22d Infantry July 6, 1812, resigned in 1814, was reappointed in 1820, became an assistant surgeon in 1821 and major surgeon July 13, 1832. He died August 8, 1848. During this campaign he appears to have actually been the chief surgeon, for he performed many of the principal operations in the general hospital.

The medical purveyor at New York sent to New Orleans a sufficient amount of medical supplies to last 1,500 men for one year. These were subject to General Taylor's orders. Other supplies were shipped to Corpus Christi, the appointed rendezvous of the expedition. At that point a general hospital was established in a frame building. It appears to have been under the charge of Surgeon N. S. Jarvis, U. S. A. Each regiment had a hospital of several hospital tents. The whole Army had twenty medical officers for 3,500 men.

Surgeon J. B. Porter said of the camp and hospitals:

Corpus Christi is in latitude 27° 49' north and longitude 97° 16' west. The extreme left of the army rested on the village, which contained the general hospital of the Army, and the medical storehouse, with guard. On landing we found ourselves directly in camp, near the water's edge, elevated only a few feet above high water mark. Passing on to the front, from one-fourth to one-half mile, is a hill 150 or 200 feet high, and beyond is the tableland. The main part of the Army occupied the low, sandy plain near the water's edge; but on the right and across a creek, was the camp of General Worth, on a bluff, several feet above the center and left of the Army.

Each regimental hospital had two or three large hospital tents, and when these were too much crowded, or long continued cases occurred, patients were transferred to the general hospital; which was a long frame building, in the village of Corpus Christi. The hospital tents were fitted up with stoves in winter and were quite comfortable. The Army had full employment in the fall and winter, preparing the camp and drilling.

This small army, encamped on the low coastal ground at Corpus Christi, although composed of Regular troops and well disciplined, would not have presented a pleasing sight to a modern sanitary officer. The care of food and water, disposal of waste, and other functions were carried on in a primitive manner or generally ignored. Neither Porter nor anyone else has described the sanitary management of the camp, but reports were left of *effects* which clearly indicate certain *causes*.

Surgeon Porter wrote in his journal:

October.—The days were warm and the nights cool, often chilly. There was much sickness, principally diarrhea and dysentery. Catarrhal affections were also common. Indeed, the whole Army in this month and part of the next, might be considered a vast hospital; few of the officers or men escaped an attack of diarrhea; and hundreds were affected who were never entered on sick report.

He states that the number constantly sick was:

Officers, 90 per 1,000, or 9 per cent.

Enlisted men, 118 per 1,000, or 11.8 per cent.

Yet most of the sickness was not of a serious character, as there were but five deaths.

In November conditions grew rather worse. Northerners came down, making camp life disagreeable and unhealthy. Porter continues:

November.—Diarrhea and dysentery were prevalent. The first part of the month was warm, but the last part very inclement. On the morning of the 30th everything was covered with ice. These days, November 30 and December 1, were the coldest of the winter, the temperature falling to 23°, and the men suffered severely. Ice was half an inch thick on the river.

His report shows that sickness had increased; the number continually sick was:

Officers, 113 per 1,000, or 11.3 per cent.

Enlisted men, 144 per 1,000, or 14.4 per cent.

The number of deaths this month was 12, in about 3,500 men; an annual rate of 41 per 1,000.

Although a disagreeable month, December witnessed an improvement in the health of the Army.

December.—Wet, cloudy, cold and inclement but a sensible decrease in sickness.

The number constantly sick amounted to:

Officers, 76 per 1,000; 7.6 per cent.

Enlisted men, 126 per 1,000; 12.6 per cent.

The number of sick varied from 350 to 475. There were 19 deaths this month.

Surgeon Porter, who had been assigned as surgeon of the 3d Infantry, gives statistics of that regiment for the quarter ending December 31, 1845:

3d Infantry, October–December 1845. Average strength 481.

Remaining sick, 60.

Taken sick, 570. Total, 630.

Sent to general hospital, 23; returned to duty, 551.

Discharged for disability, 7; died, 1; remaining 44.

The single death was due to typhoid.

Similar figures for the next quarter follow:

Remaining, 44; taken sick, 217; total, 315.

To General Hospital, 31; to duty, 262; died, 1; remaining, 15.

The single death was caused by a liver abscess, which ruptured into the peritoneum—amoebic?

On December 31 he wrote:

For several weeks past the weather has been very wet and exceedingly cold; the mercury on the 1st being as low as 23°; and ice half an inch thick was formed.

"Northers" have been frequent and the changes of temperature have been very sudden and great; hence the sickness and greater number of deaths. The number has varied from 350 to 475 during the month, having been as high as 550 in the middle of November. The Army is in better condition now, but still, on account of poor shelter and scarcity of wood, there is yet a good deal of suffering.

January, 1846, was wet and cold, as recorded by Porter, with rather more sickness than in the previous month. Having made a study of the causes of so much sickness in the Army, he set them down in order as follows:

1. Bad water—brackish.
2. Bad tents—thin and leaky. (During the winter General Taylor received lumber from New Orleans and had the tents floored.)
3. Bad air, from saturated soil and sun(?)
4. Privies. (Attention was given to police, but in a whole army of diarrhea patients, policing of the environs was necessarily bad.)
5. Variable temperature—hot days and cold nights.
6. Scarcity of fuel.

Clothing was also probably scarce, and of fuel such an arid region would yield but little.

Of the tents Porter wrote:

It is a peculiarity of our service that men are better paid, better clothed and better fed than those of any other army in the world; while they are worse lodged, both in peace and war, than any other troops. . . . At Corpus Christi during rain the water drizzled through the new tents, so as to wet everything, and many of the tents were worn out and useless. Officers could do something in the way of protection, by means of rubber coverings to their camp beds, etc.; but what could the poor soldier do? In a common tent were three of my patients, a poor woman of the 3d Infantry and her twin children, the latter in the second or teething summer, with cholera infantum, and the mother with chronic dysentery. They were all at one time in *extremis*; but fortunately they escaped with their lives, and in 1849 were all alive and hearty.

One is somewhat surprised to learn from Captain Henry that on January 8 the "Army Theater," with a capacity of 800, was opened. The scenery was painted by officers of the command, but a real troupe was employed, probably from New Orleans. The officers found some relaxation in hunting in the adjacent virgin territory. They did not escape disease, for Lieutenant Colonel Hoffman of the 7th Infantry died on November 26 and Lieutenant Allen of the Dragoons on December 6, 1845.

February.—February was generally dry and the weather beautiful. The troops were thoroughly drilled, in the field and at target firing. The sickness was less than in any previous month. Orders came from Washington for the Army to move to the Rio Grande, and from this time active preparations were going on in all departments for taking the field. The field hospitals [regimental, L. C. D.] and stores were got in readiness, and those men who were unable to march were sent to the General Hospital, which was transferred to St. Joseph's Island [Aransas Pass]. My station

was changed [from 3d Infantry] to the Artillery battalion and Duncan's Battery—12 companies in all.

The Artillery Battalion consisted of eleven companies of artillery from the 1st, 2d, 3d, and 4th regiments, serving as an infantry regiment. The Army at this time had four artillery regiments; but only one company of each regiment was supplied with guns and horses; the other eight being infantry in all but name. Three of the four actual batteries were then at Corpus Christi—Duncan's, Ringgold's and Bragg's.

During June the short term volunteers arrived on the Rio Grande to the number of 5,000, only to be mustered out in July. At the same time the new (12 months) volunteers began to arrive in considerable numbers. The volunteer regiments organized in June and July were:

	<i>Cavalry</i>	<i>Infantry</i>
Tennessee.....	1	2
Kentucky.....	1	2
Indiana.....		3
Ohio.....		3
Illinois.....		4
Missouri.....	2	Several battalions
Arkansas.....	1	
Georgia.....		1
Alabama.....		1
Maryland and District of Columbia.....		1 battalion
Louisiana.....		1 company
Texas.....		1 company

These troops were mostly moved to Point Isabel by sea, but the Missouri and Arkansas regiments marched overland to New Mexico. On July 7 the main Army moved to Camargo by steamboat, the river being higher than for years before. One regiment of Ohio volunteers and two companies of artillery were left at Matamoras. By August 18 the Army was organized into two divisions of Regulars and two of Volunteers.

1st Division, (Gen. David E. Twiggs):

2d Dragoons.

1st, 3d and 4th Infantry.

Bragg's and Ridgely's (Ringgold's) Battery.

Baltimore Battalion.

2d Division, (Brig. Gen. William J. Worth):

5th, 7th and 8th Infantry.

Duncan's and Taylor's Batteries.

Captain Blanchard's Louisiana Volunteer Company.

Maj. Gen. William C. Butler's Volunteer Division:

General Hamar's Brigade.

1st Ohio and 1st Kentucky.

General Quitman's Brigade.

1st Missouri and 1st Tennessee.

Texas Division, (Governor J. P. Henderson):
2 regiments of mounted Texans.

The total amounted to about 3,000 Regulars and 3,000 Volunteers.

There were volunteer camps at Point Isabel, at Burrita, 8 miles from the Gulf; at Camp Belknap, across the river from Burrita, and at several other points up to and about Matamoras. At one time there were 20,000 soldiers on the Rio Grande. The places were not generally unhealthy, but the Volunteers came poorly supplied. While the Regulars brought poor tents, the Volunteers brought none. The quartermaster at first supplied tents made of *muslin*. The men made shelters of brush, and later canvas tents were supplied. Measles invaded the camps and the disease proved quite fatal. The Regulars now appeared healthy, the Volunteers quite sickly.

A Volunteer wrote of Camargo:

The mortality in our camp at Camargo was appalling. The dead march was ever wailing in our ears. . . . Large hospital tents were constantly full, the dead being removed at sunrise and sunset, but to make room for the dying.—GIDDINGS.

The excessive sickness received the attention of General Taylor, who, on September 30, reported to the Adjutant General of the Army that the surgeons of the Regular Army were "too few for their appropriate duties." The Surgeon General (Lawson) replied that "The Regular Troops had comparatively as large a number of medical officers as any other Army in the world."

Porter wrote:

July 19.—Our brigade embarked on steamboats for Camargo, on the San Juan, about 4 miles above its junction with the Rio Grande. Although the banks of the San Juan are near 50 feet above low-water mark, the river had this year overflowed them, and done much damage to the town and adjacent country. A large deposit was left, the weather was hot and rainy, and if our Army had remained a much longer time, there would have been considerable sickness. As it was, there was an addition to the sick report and the cases were more severe than at Matamoras.

He speaks of the Regulars. The Volunteers did remain, and suffered as he foresaw.

ADVANCE TO MONTEREY

During August General Taylor decided to advance into the interior of Mexico, with the city of Monterey as the first objective. On August 19 the 2d Division marched for Cerralvo, reaching that place on the 25th. Porter says:

August 19.—Our brigade took up the line of march for Cerralvo, which it reached on the 25th. Treatment of diarrhea and dysentery, both here and at Camargo, was nearly the same as for the same diseases at Matamoras.

Evidently the army could not escape the diarrheas.

On September 21 the 1st Division left Camargo. By September

12 the Regular troops were all at Ceralvo and the Volunteers were on the march. In addition to the marching army, previously enumerated, other troops were encamped on the Rio Grande.

At Camargo:

General Pillow's Brigade, 2d Tennessee, Alabama Regiment.

General Marshall's Brigade. 2d Ohio, 2d Kentucky.

Illinois Brigade. 3d and 4th Illinois.

2d Infantry. Replacement.

At Reynosa:

Company H, 2d Artillery; 2 companies 1st Indiana.

Matamoras:

3d Ohio, 3 companies artillery.

Camp Belknap:

Indiana Brigade. 2d and 3d Indiana.

Mouth of the Rio Grande:

1st Indiana.

QUARTERLY SICK REPORT OF 3D INFANTRY, ARTILLERY BATTALION AND BATTERY

	Dec. 31, 1846 (3d Infantry)	March 31, 1846 (3d Infantry)	March 31, 1846 (Artillery)
Fevers.....	43	17	5
Diarrhea.....	109	21	26
Dysentery.....	95	26	39
Other digestive diseases.....	63	19	15
Catarrh.....	67	67	101
Other respiratory diseases.....	11	3	2
Brain and nerves.....	10	13	6
Genito-urinary.....	4	4	0
Rheumatism.....	25	7	21
Abscesses and ulcers.....	38	16	34
Wounds and injuries.....	34	39	28
Other diseases.....	71	39	42
	570	429	319
Mean strength.....	481	429	560

There was one death in November from typhoid and one in January from abscess of the liver (amoeba?). There was also a death in the Artillery in January from "continued fever."

METEOROLOGICAL REGISTER, CORPUS CHRISTI

(From report of Dr. N. S. Jarvis, in charge of General Hospital)

November, 1845.—Mean temperature 62.45°; highest, 89°; lowest, 30°. Rain, 3.56 inches.

December, 1845.—Mean temperature 52.33°; highest, 72°; lowest, 23°. Rain, 4.7 inches.

January, 1846.—Mean temperature, 57.25°; highest, 84°; lowest, 30°. Rain, 3.96 inches.

MARCH TO THE RIO GRANDE

Early in February, 1846, General Taylor received orders to march to the banks of the Rio Grande and actually occupy the territory claimed. The forward movement began on March 8, when Colonel Twiggs, with the Dragoons and Ringgold's Battery, set out. General Worth's 1st

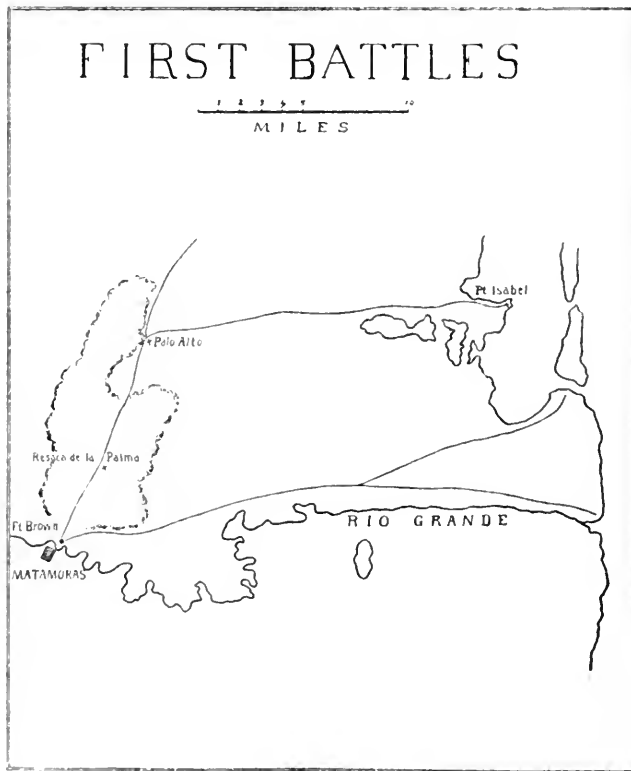


FIG. 2.

Brigade followed next day. On March 10 the 2d Brigade marched, and on the 11th the 3d Brigade and Bragg's Battery. The camp at Corpus Christi was abandoned, a new base having been fixed at Point Isabel, 9 miles north of the mouth of the Rio Grande.

The weather was fine; there was little rain and the roads were good

The men were in excellent spirits, the sick had been left behind, and the health of the marching column remained good. On March 20 the Colorado River was crossed, where a few Mexicans were seen. On the 24th the Infantry reached Palo Alto (tall timber). General Taylor, with the Dragoons, detoured to Point Isabel in order to establish the base there. On the 28th the entire force reached the banks of the Rio Grande, opposite Matamoras. War had not been declared, and for four weeks there were no hostilities. Surgeon Porter continued his journal:

April was an uncomfortable month. The rain fell in torrents and the whole country between Point Isabel and the Rio Grande was at one time nearly impassable. Our tents were of the Corpus Christi order, therefore but little protection was expected from them. The officers and men labored incessantly on a large field work, known [later] as Fort Brown. Strong guards, pickets and videttes were constantly on duty; everyone had as much as he could attend to. The weather was becoming warmer yet the sickness was not great. Toward the last of the month the rains ceased, fortunately for us, for the crisis was approaching. The men had by this time passed through the unescapable diseases, the weak had been left behind and those remaining were now hardened and fit for any duty.

THE FIRST BATTLES

On April 11 the Mexican general at Matamoras gave General Taylor 24 hours in which to leave, but the invitation was declined. On April 24 a part of the Mexican forces crossed the Rio Grande and next day captured Capt. Thornton and his troop of 63 Dragoons. This was the opening of hostilities, 16 men having been killed or wounded. The dragoons, however, were later released. But, as the Mexicans were crossing below Fort Brown and threatening to cut his line of supplies, General Taylor decided to march to Point Isabel. Leaving the 7th Infantry, two companies of artillery and the sick (about 500) at Fort Brown, he set out on May 1 with the balance of the Army and reached Point Isabel next day. Meanwhile the whole Mexican force had crossed the river (some 5,000 men) and on the 3d attacked Fort Brown. In this attack they were unsuccessful, but the commander, Major Brown, was mortally wounded.

The defense of Point Isabel having been assured, stores landed and a large wagon train loaded, the Army set out on its return, May 7. The Mexican general, Arista, took position with about 3,270 men and 12 guns, at Palo Alto, directly across the road on which General Taylor and his army were marching. This army then numbered 2,270 officers and men, with two 18-pound guns. The infantry of both armies was at this time equipped with smooth bore, flintlock muskets. The cavalry carried saber and carbine; the Mexicans also used the lance. Percussion caps and rifles were well known, but the armies had been slow to adopt them.

At about 4 p.m. on the 8th General Taylor's little army reached the front of the Mexicans at Palo Alto. Both sides attacked, and although the Americans advanced slightly, both sides could claim to have held their ground. Next day, however, the Mexicans retreated five miles to the ravine of Resaca de la Palma. They reported their loss as 252 wounded, killed and missing.

On the 9th General Taylor marched forward again and at about 4

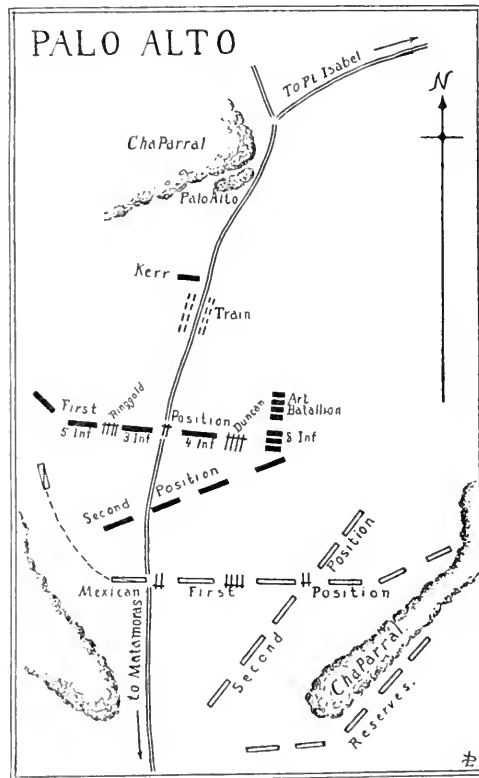


FIG. 3.

o'clock renewed the attack. The Mexicans were put in disorder by infantry and artillery fire and completely broken by an attack of the 8th Infantry. The Dragoons then charged the fleeing Mexicans and pursued them as far as the river. The defeat became a rout, with the loss of all guns, baggage, etc. The Mexican loss was reported to be 262 killed, 355 wounded and 185 missing. The American loss was 38 killed and 90 wounded. Arista had but 3,000 men left and Matamoras could easily have been taken.

Porter's description of the battles at Palo Alto and Resaca de la Palma are brief:

May 1.—Leaving a garrison to defend Fort Brown the army marched for Point Isabel at 3 p. m. We marched until past 1 at night, bivouacked until morning, and reached Point Isabel at 12 noon of the 2d. On the 3d the bombardment of Fort Brown commenced, which we could distinctly hear. Until the middle of May 7 our men labored hard on the works at Point Isabel, and at 3 p. m. our little Army started on the return march to the Rio Grande.

May 8.—Marched about 7 a. m. and at 1 received information that the Mexican

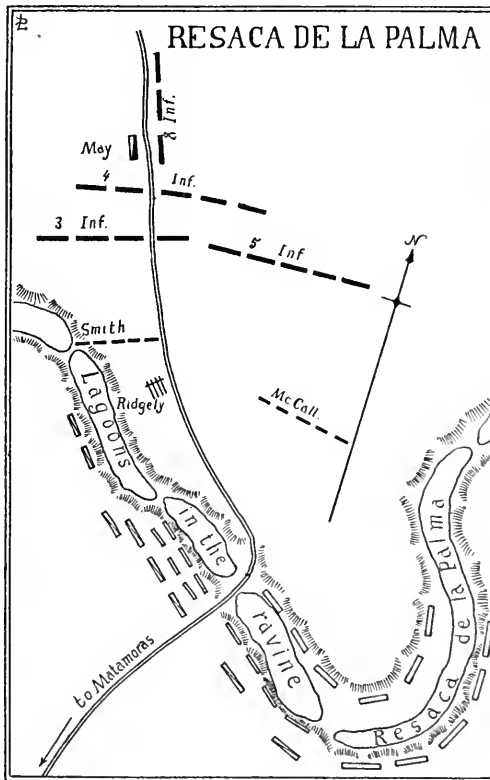


FIG. 4.

army was in our front. We advanced slowly in order of battle and in a short time came in sight of the enemy. The Army was halted, the men procured water and filled their canteens, the wagon train was parked, and everything got ready for action. We advanced slowly and about 3 p. m. the Battle of Palo Alto began. I went into action just in rear of the battalion and the cannon shot by the enemy, passing over our ranks *en ricochet*, fell thickly around me. Soon our men began to fall and the medical officers had plenty to do in the hospitals. [In the artillery battalion there were nine wounded and four in Duncan's Battery.] The battle did not end until

half an hour after sundown. It was fought almost entirely by the artillery; the loss was not great but the wounds were severe and the surgeons were employed until late at night. The principal loss was in our brigade, at that time commanded by Colonel Belknap; the enemy having attempted that flank of our Army. [The 8th Infantry had 4 men killed, and 16 wounded.]

May 9.—Early this morning the enemy was seen moving off in the direction of Matamoras. The surgeons were busily employed with our own and the Mexican wounded left upon the field; and about 1 o'clock they were all started off to Point Isabel, where hospitals had been made ready. Just as we were preparing for a forward movement a melancholy accident occurred. Lieut. J. E. Blake, Topographical Engineers, who had the day before daringly reconnoitered the enemy in presence of both armies, was mortally wounded by the accidental discharge of his own pistol. It was done in sitting down. The bullet entered the perineum and passed through the abdomen and thorax. He died in an hour or two.

At 2 o'clock our Army took up the line of march and about 3 our light infantry under Captain McCall, received the first fire of the enemy at Resaca de la Palma. The different regiments were brought up to the field of action as rapidly as possible. The battle was finally ended by a charge of the reserve [8th Infantry], which broke the enemy's center, took the artillery, and secured a complete victory. The field where the main struggle took place presented a sad appearance; the bodies of men, horses, arms, vehicles etc., were scattered in all directions.

The battle was ended but the labors of the surgeons began. Another and more arduous night's work was before us and Surgeon Wright [J. J. B. Wright] and myself were the only officers of the brigade; our two assistants having been detached in the morning. Our wounded were much more numerous than the day before and a large number of wounded Mexicans had been left on our hands. [The brigade reported 11 killed and 39 wounded.]

May 10.—Our duties early recommenced and the whole medical staff was engaged much of the day with our own and the Mexican wounded. On the 11th, until 3 p. m. we were busily engaged in getting off our wounded to Point Isabel, expecting warm work before Matamoras. On the 12th a large number of Mexican wounded were sent across the river to Matamoras, and on the 18th we crossed the Rio Grande and took quiet possession of the town."

On May 18th General Taylor, having heard that Arista had abandoned Matamoras, crossed and entered the place. He found four hundred wounded in most miserable plight. Captain Henry says: "I visited the different hospitals; they were filled with the wounded and dying. The stench that arose from them, from want of police, was disgusting. . . . I left the house shocked with the horrors of war. The enemy left their wounded comrades with very little attention to their wounds."

At this time no volunteers had joined the American Army, but General Taylor had called for 5,000 men from Texas and Louisiana, and they had begun to arrive at Point Isabel. These were three or six month's volunteers, who were quickly discharged. On May 13, following the battles, Congress authorized 50,000 volunteers, to serve twelve months.

CASUALTIES, PALO ALTO AND RESACA DE LA PALMA, MAY 8 AND 9, 1846.

	First day		Second day	
	Killed	Wounded	Killed	Wounded
General Staff.....	0	0	0	1
Dragoons.....	0	6	11	8
Ringgold's Battery.....	2	1	0	4
Duncan's Battery.....	0	4	0	0
Artillery Battalion.....	3	9	3	7
3d Infantry.....	0	0	2	5
4th Infantry.....	1	3	4	5
5th Infantry.....	0	5	10	28
8th Infantry.....	4	16	8	32
	10	44	38	90
Total.....		54		128

Grand total, both days, 182.

Of the wounded at Palo Alto, ten, and at Resaca de la Palma, eleven, were afterwards reported to have died; a mortality of about 16 per cent, the average at that time.

MATAMORAS

The troops remained in Matamoras from May 18 until July 19, when an advance was made to the south, in the direction of Saltillo. At Matamoras there was a considerable amount of sickness, but of a rather mild nature. The June 30 quarterly report for the Artillery battalion and battery showed 355 cases in an average strength of 564. There were 95 cases of diarrhea or dysentery, 23 of fevers, 37 of catarrh, 53 wounds and injuries, and 62 other diseases. There was but one death from disease, (acute dysentery).

By June 3 General Taylor had near 8,000 men about Matamoras. The volunteers were:

- 6 small regiments from Louisiana.
- 7 companies from Alabama.
- 12 to 15 Texas companies.
- Colonel Johnson's Texas Regiment.

Porter says of the period, May and June:

Notwithstanding the numerous cases, the troops could not be considered sickly; recovery was rapid, and convalescence was not slow, so that the patient was returned to duty. This was probably owing to the heavy rains in the last of May and in June, which served the double purpose of preserving the health of the Army and

rendering the Rio Grande navigable for steamboats. The residents of Matamoras say that when the river rises so as to fill all the lakes and lagoons about town the summer is healthy; but when the river is low and the lagoons are not full it is sickly. There is little doubt of their correctness. In 1846 the lakes and lagoons were full; hence the comparative mildness of our diseases and the small mortality; for in the next year [1847] there was great sickness and mortality, and the river was low, the lagoons containing but little water.

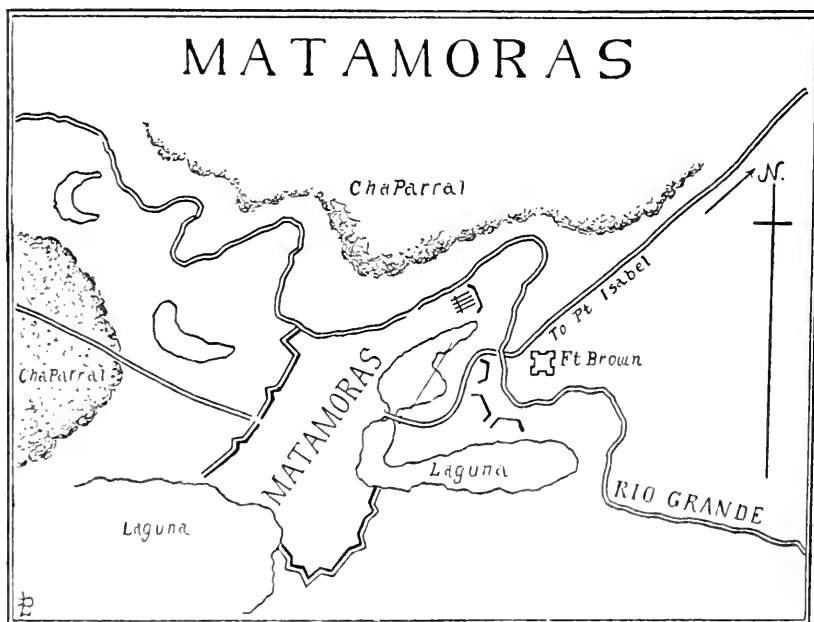


FIG. 5.

On September 14 the advance from Cerralvo was begun and on the 17th the whole Army was at Marin, within 24 miles of Monterey. It appears that in this march there were no wagons for baggage, all such incumbrances being carried on pack mules. Yet the road was excellent and large supply trains followed. The lack of wagons naturally caused grumbling. The road ascended among the mountains into a richer and more beautiful country, and the health of the troops improved.

Porter says:

September 14.—Marched from Cerralvo, with the main Army, for Monterey, in front of which we encamped on the 19th, between three and four miles from the town, by a small stream formed by the junction of numerous springs, issuing from the limestone formation, and a large grove of Pecan trees, called by the Mexicans *El Bosque de St. Domingo*, and by the Americans, Walnut Grove.

The Army assembled in front of Monterey on September 19 numbered about 6,000 officers and men. On account of its stone buildings and sur-

rounding heights the town was naturally strong; it was well fortified and had a sufficient garrison. That it was captured was due largely to good luck, and to poor management on the part of the Mexicans. The movement was begun on the 20th. Conflict actually began on the 21st, continuing for three days and ending in capitulation by the Mexicans on the 24th.

Porter's account is brief:

ATTACK AND CAPTURE OF MONTEREY

September 20.—General Worth's Division, consisting of Duncan's and Mackall's batteries, the Artillery Battalion, the 5th, 7th and 8th Infantry regiments, Hay's Texas mounted rangers and a company of volunteers from Louisiana, moved from the main camp about 12 o'clock m., for the rear of Monterey, to find and take possession of the Saltillo Road and attack the enemy's defenses on that side of the town. After a reconnaissance, and approaching the enemy's position on the *Loma de Independencia*, the summit of the height above the Bishop's Palace, we bivouacked for the night. A heavy rain came on about sundown and a drizzling rain continued part of the night.

September 21.—Early this morning the division was put in motion, passing under the enemy's batteries, and after some fighting in front took possession of the Saltillo Road. Being the senior medical officer with the division, I was directed by General Worth to organize a general hospital for the wounded, the preparation for which had been made at Camargo and Cerralvo. Today the hill called *Federacion*, and the small fort *La Soldada* were stormed and our wounded were afterwards removed to a new position, and nearer the field of operations. Heavy rain came on before sunset, and the night closed in dark and dreary.

September 22.—The *Loma de Independencia* was carried long before sunrise, and during the day the Bishop's Palace, situated upon and midway the southern slope of the hill *Independencia*, fell into our hands. Our wounded were removed to the Palace before night.

September 23.—The division moved about 4 o'clock p. m., to the assault of the town and discharge of artillery and musketry continued until long after dark. Apprehending a severe loss in this attack, General Worth directed me to remain in the General Hospital at the Palace, and receive the wounded as they were sent from the field of battle. Preparations were made for early action tomorrow.

September 24.—No fighting; and the articles of capitulation were signed, by which the town fortifications, etc., fell into our hands.

September 25.—Our wounded were removed about half a mile, to the residence of General Arista, a beautiful place with delightful gardens, plenty of water and etc., where the general hospital for our division was permanently established.

Another picture of the attack and capture of the Mexican city of Monterey is afforded by a letter of Dr. N. S. Jarvis, who took part in it and viewed the changing scenes from the standpoint of a surgeon. Dr. Nathan S. Jarvis, of New York, was appointed assistant surgeon March 2, 1833, surgeon July 7, 1838, and died May 12, 1862. His letter, dated October, 1846, published in the *New York Medical Journal*, March,

1847, and republished in *The American Journal of the Medical Sciences*, Volume XIV, 1847, read as follows:

On the 19th of September we encamped within 4 miles of Monterey, in a grove of Peccan trees, called Walnut Grove; where we were abundantly supplied with clear and cold water, from a stream of considerable size, formed by the junction of numerous springs. The combination of wood and shade rendered the spot admirably fitted for an encampment. On the following day parties were employed in reconnoitering the enemy and in observation of the fortified position of the town. Toward evening my regiment, 3d Infantry, with another, were advanced a mile toward the town, to cover a party of engineers, but returned to camp about 9 p. m.

On the morning of the 21st the whole division was thrown forward toward the

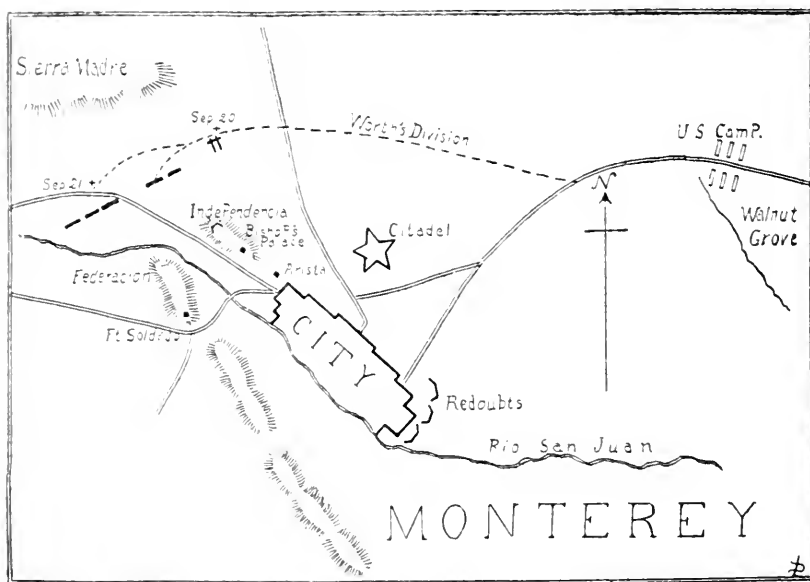


FIG. 6.

city, with a view, as we supposed, of making a diversion while the 2d Division, under General Worth, moved on the western side of the city by the Saltillo Road. . . . As soon as we emerged from cover the batteries opened their fire, completely sweeping the plain in every direction and enfilading the advancing columns of our troops.

Now it was that my professional labors commenced; the nearest and only shelter that presented itself to me for the wounded, falling every moment, was a quarry pit, 4 or 5 feet deep and the same in breadth. Several of these were contiguous, and to them I directed the wounded to be carried. By stooping we were protected from the shots which became thicker every moment; as our troops had now advanced within range of the enemy's fire, and the moment they perceived a party of men bringing the wounded to us, they directed all their guns upon it. I already had

performed one amputation and was preparing for a second, when three fugitives rushed into the pit, falling over the wounded that lay there crowded together, saying that a large body of lancers was approaching. So little credit did I attach to their report that I never raised my eyes to observe them; which circumstance doubtless saved us all. Had I been discovered all would have been massacred, as in their headlong fury they would neither have delayed to ascertain our character or profession, nor have paid much respect to our patients. Several soldiers who has sought an adjacent pit, with an officer, were slain. The lancers were soon after repulsed by a regiment of Ohio and Mississippi Volunteers. . . .

The first wounds were received in crossing the plain and were inflicted by grape and cannon shot [solid shot]. These wounds were all low; generally at or just above the ankles. Of the first three men brought to me two had received wounds from 12-pound shot, just above the ankle, which had nearly severed the limbs, which were hanging only by a portion of integuments. The other had his heel torn off by a 6-pound shot. Shortly after, our troops having advanced within reach and under fire of the Mexican infantry, numerous cases of wounds by musket and *escopette* balls were brought to me: the latter are one third larger than our musket balls, and consequently inflict a more severe and formidable wound. So numerous at this time became the wounded in our pit, and so constant and heavy the fire, as to compel us to remove our hospital several hundred yards further to the rear. We had not long been in our new position, when some covered wagons bringing the wounded attracted the attention of the enemy, who immediately reopened their fire, compelling us a second time to remove beyond the range of shot.

Among the numerous projectiles, occasioning severe and fatal wounds, were grape, cannister, fragments of iron and copper shells, and stones knocked by the balls from the corners of buildings and walls. Their shells were thrown with great accuracy, frequently into the midst of a body of troops, but fortunately killing and wounding but few.

Before speaking of any particular wounds, I will here take occasion to make some remarks reflecting the character they assumed, and the peculiar causes acting to prevent a favorable result, so far as regarded the healing of all, even the most slight. The first annoyance we experienced, and one which no doubt exerted an injurious effect, was one little anticipated at the time. The moment a limb was amputated numerous flies would alight on the stump, and must have deposited their eggs, for when it became necessary to dress the stump myriads of maggots were found buried in it, which could only be expelled with great difficulty; rendering it necessary in some instances to reopen the flap, for their complete extermination.

A much more formidable enemy made its appearance in an erysipelatous inflammation of the integuments covering the stump, which generally set in two or three days after the operation; and notwithstanding all the means made use of to arrest it, commonly ended in sloughing, and either proved fatal or rendered secondary amputation necessary. That some influence existed previously, external or internal, from causes connected with the state of the atmosphere, or habits of the men, arising from diet or water, was manifest. The slightest wound or scratch became in every case a tedious ulcer; in some cases proving a cause for serious alarm. Apparently the most trifling wounds required an unusual time for healing, and even those that had previously healed would break out again and present greater difficulty in their cure than in the first instance.

At this period no atmospheric causes apparently existed to produce this unfavorable aspect of things. Nothing could exceed the loveliness of the weather;

and if the middle of the day was warm, the morning and evening refreshed us by a most delightful temperature and cloudless sky. No rain had fallen, with the exception of one or two showers, for nearly a month; and consequently little moisture existed to produce its well known morbid influence.

Dr. Jarvis, like many men from the beginning of time, ascribed the debilitating infections of his patients to mysterious or supernatural causes, never dreaming that the causes were much simpler and were carried from one patient to another by his own instruments, sponges and hands. Doubtless the low state of some of the men hindered prompt healing, but the "effluvia" which he and many others were so fond of invoking was as much a figment of the imagination as the evil influence of the gods which served as an excuse for more primitive medicine men.

Immediately after the capitulation of the city on the 25th of September, all the wounded of the different divisions entered the town and suitable buildings were provided for their accommodation. Upwards of 200 officers and men [150 the reports say, of whom 13 died] from the 1st and 3d Divisions, who had been most severely wounded, were conveyed thither on the same day, in litters and wagons.

Our camp afforded no comfort nor shelter for them, beyond a few small tents and a solitary blanket laid on the ground; and many were destitute of even this apology for a bed; having lost theirs on the march. Many had no other clothing than that in wear, which was not only soiled and torn in climbing over the hedges, walls etc., during the battle, but was stiff and saturated with blood from their wounds. A few days after their reception into the hospital tertian intermittent fever made its appearance, attacking many of the wounded, and in the majority retarding or completely arresting convalescence. On many of those severely wounded it exerted a decidedly pernicious influence, and no doubt contributed in some cases to a fatal issue. It not only attacked the wounded in the hospital, but prevailed extensively in the camp and among the population of the town and neighboring country. I cannot say to what extent this may be attributed to the putrid exhalations arising from the numerous bodies of men and horses slain in the different combats, and which had been slightly covered with earth, and emitted a most sickening odor and offensive effluvia. This doubtless contributed largely toward infecting or destroying the purity of the air and establishing a poisonous miasma.

Surgeon Porter made notes of a number of cases of gunshot wounds at Matamoras. He said, "Wounds of the head, unless slight, may be considered dangerous." Of five reported, at least two died. Of wounds of the face, lower jaw and neck he said: "Desperate wounds of these parts often recover, such is the vitality of the parts from the free distribution of nerves and blood vessels, provided no nerve or vessel essential to life is injured." In wounds of the upper extremities he follows the teaching of Guthrie: "An upper extremity should not be amputated, for almost any accident or accidents that can reasonably happen to it from musket shots." He reported four cases. As to chest wounds he said, "Penetrating wounds of the chest are always dangerous." The two reported ended in recovery.

His prognosis for abdominal wounds was gloomy: "Gunshot wounds

of the abdomen are nearly always fatal. Recovery may take place, and desperate cases of this kind *have* recovered, but they are an exception to the rule." The two cases described by him were not exceptions. "Wounds of the pelvis and parts adjacent are exceedingly dangerous." The two described proved fatal.

"Gunshot wounds of the lower extremity are much more serious than those of the superior. Wounds of the foot and leg do not, by any means, recover so readily, or so perfectly as wounds of the hand and forearm; and gunshot wounds of the upper third of the femur are among the most terrible that can be inflicted." Nevertheless he records some thirteen cases, some severe, with but three deaths. It seems certain that ether was not used in operating. It was then just coming into use and Porter was a strong opponent of anaesthetics.

Treatment of Gunshot Wounds.—When a musket ball has passed through a fleshy part, the wound may be dressed with a little lint, adhesive plaster, and a few turns of a roller, and afterwards the cold-water dressing, or lead lotion, both excellent, may be applied. . . . When the bone of a limb is injured, and amputation is not considered necessary, much the same treatment is advisable, after removing splinters and foreign bodies. . . . It is never expected that a gunshot wound, however simple, will heal by first intention; nor is it expected that a wound of this character can, by the use of cold dressings, or by any treatment whatever, be prevented from suppurating to some extent. . . . Suppuration and sloughing are always expected to occur, more or less, in all gunshot wounds. . . . In all gunshot wounds, whether simply through the flesh, or with injury of the bone, whenever the part becomes stiff and painful, poultices for a short time are useful. In Mexico, we had linseed meal, generally, corn meal; a good poultice could always be prepared from the bark of the slippery elm [*ulmus fulva*] of which we had a supply; and the leaf of the prickly pear [*cactus opuntia*].

Other notes made were:

"Not a single case of hospital gangrene, tetanus or secondary hemorrhage was seen by the writer during the war with Mexico."

"*Bayonet and lance wounds* were not common in Mexico. The brilliant charges of opposing columns in battle are almost always charges on paper."

He quotes Guthrie to the same effect. Venesection was little used, but cathartics, etc., instead.

The diet of the wounded in Mexico was more nourishing than that usually recommended by systematic writers. As soon as the first inflammatory symptoms had subsided, and there was the least appetite, the patients were put upon nourishing diet, as, chicken, tea and broth, beef-tea and broth, beef soup, coffee, fresh meat, etc., and in certain cases an allowance of wine, or even brandy.

The wounded of our Army at Palo Alto and Resaca de la Palma did better than the wounded of the other battlefields in Mexico, for several reasons; the army was in the low country near the sea and under the influence of sea breezes; malaria had not become developed; the men were hale and hearty after the severe winter at Corpus Christi; and the invalid and worthless troops had been left behind. [3d Infantry: January, 433 men; February, 411; March, 374; officers, 27 throughout.]

At Monterey the reverse obtained; it was later in the season; there were hot days

and cold nights; malaria was developed; the men were reduced by fatigue, exposure and sickness; and the Army was at an elevation of more than 4,000 feet above the level of the sea.

The casualties of the Regular troops at the taking of Monterey were reported to have been, 65 killed and 150 wounded, of which latter 13 died. The total for all troops was killed 122, wounded 368, total 490. The 1st Tennessee Cavalry Regiment alone had 26 killed. Worth's Division, which made the flanking march had but 9 men killed; Twigg's Division, 56.

In quiet possession of Monterey, in quarters, with plenty of provisions, and the arduous duties of the campaign at an end, it might have been anticipated that our division especially would enjoy an almost entire immunity from disease. Not so; the period of rest is the period of danger to armies, particularly in unhealthy countries. . . . Could our Army have marched to Saltillo and San Luis Potosi within a week after the capitulation, made daily marches, fought a battle or two, and suffered hardships and privations, it is verily believed that our cases of disease would have been a sixth less. This is in conformity to experience.

Diseases of Monterey in the Autumn of 1846.—They were malarious, intermittents, and remittents; mostly the former in the battalion and in the General Hospital. But at other points, as the Citadel, there were remittents and congestive fevers as I was informed by Assistant Surgeon de Leon. During the operations around the town, and subsequent to the capitulation on September 24, the weather was variable and the men were predisposed to these diseases from encamping in the low country in summer, exposure, and fatigue. The following extract is from my notes:

September 25: The nights are quite cool, days not hot.

September 27: Our sick are increasing in number; some of the wounded are doing well; others not.

October 1: The weather is clear and pleasant.

October 3: Quite a cool morning. Many of the men have severe wounds, but in general they are doing well.

October 7: Flying clouds and stray easterly winds, hot in the middle of the day; cold at night.

October 10: A number of cases of intermittent today.

October 12-15: More or less fever cases daily.

October 16: The weather is bitter cold. Fevers are extremely prevalent; very many are sick and the effect on the wounded is unfavorable.

October 18-19: Weather the same and the fever cases multiply as a matter of course.

October 21: Cloudy, warmer than for some days past, and fevers seem somewhat abating.

October 31: Muster day; rather warm, but the weather is beautiful. From the 1st to the 13th there were ten companies in all; and from the 13th to the end of the month there were eight; and the number of sick amounts to an average of 14 to each company; or 21 per cent of the battalion; and, including Duncan's Battery, to more than 24 per cent. The inhabitants of the town have suffered severely from fevers, as well as our own troops. The disease continued more or less to the end of the year.

Several writers, including Captain Henry, were enchanted by General Arista's palace, which appears to have been a near-Alhambra, with flowers, shady groves and fountains. Captain Henry said of it:

I visited Arista's palace, which is directly under the hill on which the Bishop's Palace is situated. It is a long, low, white stone building, beautifully furnished, claiming no particular order of architecture, with flat roof, thick walls and stone floor. At the back of the house is a portico 20 feet wide and a garden that rivals Oriental magnificence.

It has been turned into a hospital for the wounded of Worth's Division. The oranges in the garden were kept for the wounded, but immediately outside there was a wilderness of them, where everyone picked what he pleased.

The wounded are doing well—as well as they can, with the few comforts and conveniences our medical department are able to supply. Nothing can exceed the devotion of our medical officers; they are literally fatigued to death. There was culpable negligence somewhere in not sending more medical officers into the field. The number was reduced so low immediately after the battle that *one* surgeon attended *two* regiments, *four* being the usual number in peace!

After the capitulation the filthy streets were cleaned up and the place generally put in order. Good feeling generally prevailed between troops and inhabitants. Yet there was a considerable amount of disorder and violence among the soldiers, generally ascribed to the volunteers. After the battle all the Texas troops, believed to have been particularly violent, were discharged. The Army settled down to several months of quiet. The capitulation of the city had included an armistice, which continued until November 2.

SICK REPORT, ARTILLERY BATTALION AND DUNCAN'S BATTERY

	June 30, 1846	Sept. 30, 1846	Dec. 31, 1846
Fevers.....	23	65	600
Diarrhea.....	25	98	55
Dysentery.....	70	106	37
Other digestive disorders.....	24	23	8
Catarrh.....	37	57	51
Other respiratory disorders.....	2	3	5
Brain and nervous.....	14	1	1
Genito-urinary.....	3	5	19
Rheumatism, acute.....	9	5	3
Abscesses and ulcers.....	33	33	14
Wounds and injuries.....	53	89	32
All others.....	62	90	30
	355	575	855
Deaths.....	1	2	5
Average strength.....		475	564

MARCH TO SALTILLO

In September, 1846, an armistice was agreed upon and hostilities ceased for a time, but on November 13 this armistice was terminated and General Taylor marched his army to Saltillo, the capital of Coahuila, which was occupied on January 23, 1847. Porter wrote of Saltillo:

November 13, 1846.—Our division marched to Saltillo, which was occupied on the 16th. This town is situated near the end of the mountain gorge, about 50 miles from Monterey; latitude $25^{\circ} 26''$, longitude $101^{\circ} 1'$, and contains 12,000 or 14,000 inhabitants. According to Wislizenus, Saltillo is 5,240 English feet above the level of the sea. It may be 1,000 feet above Monterey; certain it is that the latter is the extreme limit of the orange, and the apple grows abundantly around Saltillo; and after the capitulation a brisk little trade in apples and oranges was carried on between the two towns.

Saltillo bears no comparison with Monterey in beauty or in the character of its inhabitants. On our march to the town a Mexican informed us that it was *mucha mala*, containing *muchas putas y ladrones y matadores*, and it was not long before our troops suffered from them.

Veneral Diseases.—There was a great difference in their frequency in the different towns of Mexico. Matamoras, Camargo, Monterey and Vera Cruz were quite free of them; while at Saltillo and in the City of Mexico they were rife and of virulent character. Our battalion did not suffer so severely at Saltillo as some of the infantry regiments, one of which, in particular, when we left in January, was much crippled, requiring several wagons for those who were *hors de combat*.

Commodore Perry having captured Tampico and turned it over to General Taylor, that officer established a defensive line from Parras to Tampico, leaving garrisons at Monterey, Camargo and near Matamoras. Early in January General Taylor advanced to Victoria, the capital of Tamaulipas, but when General Scott organized a new army and took nearly all the Regular troops from the Army of Occupation, Taylor was obliged to stand on the defensive and fell back to Buena Vista, 7 miles south of Saltillo. His army then numbered 4,759, of whom 4,242 were volunteers. His only Regular troops were three troops of Dragoons and three batteries: A and E of the 1st Dragoons, and E of the 2d; Batteries C and E of the 3d Artillery and B of the 4th.

At Buena Vista General Taylor's army was attacked by a much larger force of Mexicans on February 23 and was not far from being beaten before victory was determined for his forces.

BUENA VISTA

The Battle of Buena Vista, once the subject of much oratory and song but now almost forgotten, was described by Dr. W. B. Herrick, then surgeon of the 1st Illinois Volunteer Infantry; later professor of anatomy in Rush Medical College:

Our small army of about 5,000, mostly volunteers, occupied the position of Agua Neuva, 10 miles from Saltillo, on the road to San Luis Potosi. Early on the

22d of February Santa Anna arrived at Aqua Nueva, where he evidently intended to attack us; but he was disappointed by a prompt move of our general, who abandoned this weak position and took up a position near the place now known as Buena Vista.

By dawn of the 22d all our pickets had been drawn in and by 10 o'clock the main body of the Mexican army could be seen advancing in dense columns, marked by a cloud of dust, extending as far as the eye could reach. During this time an occasional volley of musketry could be heard, showing that skirmishing had commenced; but as yet no wounds had been received. The enemy's armies continued to arrive and take their positions until their vast line extended itself across the valley to the very base of the mountains, a distance of nearly a mile.

The action commenced with an attempt to get possession of a hill on our left flank. A detachment of riflemen was sent to oppose this movement. The action thus begun continued until dark.

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The wounds received upon this first day were mostly from spent balls, not more than two or three proving fatal. The extraction of a few balls and the application of simple lint and bandages was therefore all the surgical aid required on the evening of the 22d.

This was but a preliminary skirmish. The real battle took place on the 23d.

By dawn of the 23d the action was again commenced and by 9 the whole force of the enemy was seen advancing to attack us. The different surgeons, with their stewards and such others as had been detailed to assist them, had already stationed themselves at convenient points, ready with a plentiful supply of instruments, ligatures, bandages, splints, etc., for the arduous and responsible duties of the day.

Up to this time we had leisure to watch the movements of the enemy and indulge in some not very pleasing anticipations with regard to the result of the approaching contest. The action, however, soon commenced, as it seemed to us, by a simultaneous discharge of musketry from both opposing lines, and in a short time after all thoughts upon other matters had vanished, to give place to an intense anxiety to determine correctly what to do in certain cases; where to cut for a ball, how to dress a fracture, or if to amputate or attempt to save a limb.

From the hour of attack of the enemy in the morning to a long time after their retreat at night, the labor, both of body and mind, of every surgeon on the ground was both unremittent and constant. For it was continually happening that long, long before all the cases consequent at one charge could be disposed of in the most cursory and hasty manner, another desperate onset would be made, to add to the number of unfortunates still lying around us, waiting for aid.

The most common practice adopted by the different surgeons upon the field was in the care of gunshot wounds, to extract if possible all foreign substances, and in cases where balls could be found, to cut for and extract them at once. A simple pledget of lint and bandage were in most cases all the dressings required. In some few cases compresses and tight bandaging were necessary to prevent hemorrhage. But few, if any, cases that I am aware of required ligation of an artery to stop bleeding. In case of fractures, most of which were necessarily both compound and comminuted, the common practice was to extract all pieces of bone that were found so detached as to endanger their vitality and remove all foreign substances; and then to apply bandages and splints.

With regard to amputations upon the field, the rules generally adopted were: To amputate at once whenever the principal vessels and nerves of a limb had been destroyed; in case of fracture where the bone was very much shattered; and when important joints had been much injured.

On the day of the battle [February 23] the wounded, after receiving such attention as their surgeons could give them, were removed from the field; some to Saltillo, others to the *Rancheria de Buena Vista*. When on the evening of that day we arrived at the *Rancheria* we found the wounded, the dying, and the dead crowded together indiscriminately and presenting a melancholy picture of suffering and distress, not easily described and never to be forgotten. As soon as possible those still living were selected, placed in wagons and conveyed late at night to the large cathedral in town, which had already been converted into a temporary hospital.

[The *Rancheria* was a general field hospital near the scene of battle, while the cathedral in Saltillo was the more permanent or base hospital of the Army. There could be no immediate evacuation.]

The time, both day and night, for the next 48 hours was spent by the surgeons in attending to such wounds as had been overlooked on the field, in renewing dressings, and in performing amputations and other operations. During the three or four days after the battle the wounded were removed from the crowded church to more convenient buildings, each capable of containing from 50 to 100 patients. In making these more permanent arrangements those of the volunteers from the same states were, as a rule, as far as possible, collected in the same hospital. The wounded of the 1st and 2d Illinois consisted of nearly 100. About 10 officers were placed in private quarters and 80 to 90 privates in one of the best and most commodious of the hospitals. Myself, and so far as I know, all other surgeons in charge of hospitals, on making the proper requisitions were provided with assistants, attendants, hospital stores, provisions etc., promptly and to an extent creditable both to the officers in charge, and to our country.

With regard to the treatment and subsequent termination of the cases, it may be stated that most of the simple flesh wounds healed rapidly and kindly under the dressing of lint, changed once in 24 hours, with an occasional aperient and proper diet. The presence of foreign substances in the simplest wounds frequently caused protracted suppuration and the formation of abscesses. Stimulants and tonics, such as brandy, wine, iron and acids were used freely, and with marked benefit in all cases of debility consequent on suppuration. The gunshot wounds in which bones were injured proved most difficult to treat. In a majority of instances primary amputations were followed by favorable, and secondary by unfavorable results.

The enemy proved themselves barbarous by murdering all our wounded they have met on the field, thus leaving alive but a small number of those most severely wounded; consequently the proportion of deaths to the number treated was comparatively small, not averaging, as we believe, more than 5 or 10 in 100. In the hospital provided for the wounded Mexicans, placed in charge of their own surgeons, at least one half the cases terminated fatally.

General Taylor wrote of the wounded in his report:

No further attempt was made by the enemy to force our position, and the approach of night gave an opportunity to pay proper attention to the wounded, and also refresh the soldiers who had been exhausted by excessive watchfulness and combat. Though the night was severely cold, the troops were compelled for the

most part to bivouac without fires, expecting that morning would renew the conflict. During the night the wounded were removed to Saltillo [10 miles] and every preparation made to receive the enemy should he attack our position. . . .

On the following day our own dead were collected and buried, and the Mexican wounded, of which a large number had been left upon the field, were removed to Saltillo, and rendered as comfortable as circumstances would permit. . . .

A command was despatched to Encarnacion on the 1st of March. Some 200 wounded and 60 soldiers (Mexican) were found there, the Army having passed on with greatly reduced numbers suffering much from hunger. The dead and dying were strewn upon the road and crowded the buildings of the Hacienda.

TROOPS AT BUENA VISTA.

General Staff.....	41
1st Dragoons, A and E.....	133
2d Dragoons, E.....	76
3d Artillery, C and E Batteries.....	150
4th Artillery, B Battery.....	117
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Total of Regular Troops.....	517
Arkansas Cavalry.....	479
Kentucky Cavalry.....	330
2d Kentucky Foot.....	571
Mississippi Rifles.....	368
2d and 3d Indiana.....	1,253
1st Illinois.....	580
2d Illinois.....	573
Texas Volunteers.....	61
McCullough's Spy Company.....	27
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Total Volunteers.....	4,242

Grand total..... 4,759

The casualties were: Killed, 267; wounded, 456; missing, 23.

The Mexican forces were believed to number about 15,000 and their losses were reported at more than 3,000. Their army was almost annihilated by the battle and the hardships following it.

MEDICAL OFFICERS AT BUENA VISTA AND SALTILLO

Chief surgeon: Presley H. Craig, U. S. Army.

Surgeon: John C. Reynolds, U. S. Volunteers.

Surgeon: Seymour C. Halsey, U. S. Volunteers.

Surgeon: William B. Herrick, U. S. Volunteers.

Assistant Surgeon: C. M. Hitchcock, Zabriskie.

2d Dragoons and Artillery: Thomas C. Madison, assistant surgeon, U. S. Army.

1st Dragoons and Artillery: W. Levely, assistant surgeon, U. S. Army.

1st Illinois: C. Peyton, assistant surgeon, U. S. Volunteers;—— Wilkerson, assistant surgeon, U. S. Volunteers.

2d Illinois: Edward B. Price, surgeon, U. S. Volunteers.

2d Indiana: D. S. Lane, surgeon, U. S. Volunteers;—— Walker, assistant surgeon, U. S. Volunteers.

3d Indiana: John S. Athow, surgeon, U. S. Volunteers; ——— Dunn, assistant surgeon, U. S. Volunteers.

2d Kentucky: Joseph G. Roberts, surgeon, U. S. Volunteers; ——— Castile, assistant surgeon, U. S. Volunteers; ——— Lafon, assistant surgeon, U. S. Volunteers.

Mississippi Rifle Regiment: ——— Thompson, surgeon, U. S. Volunteers.

Detachment 2d Ohio: ——— Trevitt.

Arkansas Cavalry Regiment: E. H. Roane, surgeon, U. S. Volunteers.

Kentucky Cavalry Regiment: Alexander C. Hensley, surgeon, U. S. Volunteers; ——— Blanton, assistant surgeon, U. S. Volunteers.

Detachment Arkansas Volunteers: Dr. ——— White.

The Battle of Buena Vista marked the end of active operations in northern Mexico. From that time on, General Taylor merely held his position while the outcome of the war was decided by General Scott and his army before the City of Mexico. A considerable number of volunteer troops were maintained on the Rio Grande and farther forward until the next year. Sickness continued to ravage the Army, the departure of the Mexican army resulting in few less casualties than before. During the entire war the volunteer troops suffered a loss of nearly one-third their total in the course of twelve months. About 120 in each 1,000 died by reason of disease; more than 180 were discharged for disability, and some 70 deserted. In other words, three men of each ten died or were discharged for physical disability, and one of each three was lost to the Army. This loss was largely the result of the lack of sanitary knowledge and management.

CASUALTIES IN PRINCIPAL ENGAGEMENTS

	Killed	Wounded	Died of wounds
April 26, 1846, Captain Thornton's Engagement....	11	6	0
May 4-9, 1846, Fort Brown.....	2	9	1
May 8, 1846, Palo Alto.....	5	43	10
May 9, 1846, Resaca de la Palma.....	33	89	11
September 21-23, 1846, Monterey.....	122	368	?
February 22-23, 1847, Buena Vista.....	267	456	?

The greatest regimental loss in 1846-47 was that of the 5th Infantry, which totalled: killed, 41, wounded 178. As the regiment never mustered more than 500 men, this casualty list is proportionately very large.

The following notes are extracted from "The Medical Department of the United States Army, 1775-1873," by Assistant Surgeon Harvey E. Brown, U. S. Army.

NOTE 1.—When General Taylor moved his Army across the river and occupied Matamoras, a hospital was established at Fort Brown under charge of Assistant Surgeon L. C. McPhail, and on the 25th of June a general hospital was opened in Matamoras and placed in charge of Surgeon J. J. B. Wright. Meanwhile, a body of troops occupied Reynosa, Mexico, about a hundred miles up the river, where the hospital was attended by Assistant Surgeon Laub, who on the arrival of the main Army at Camargo in August, joined that body, having been relieved by Assistant Surgeon Wotherspoon.

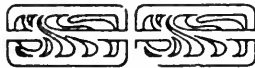
Early in September the purveying depot at Point Isabel was moved to Camargo, which was established by General Taylor as his base of supplies on the march to Monterey. On the departure of the Army, Assistant Surgeon Wells, in addition to his duty as purveyor, was given general direction of all the hospitals, regular and volunteer, in and around Camargo. In this portion of his duties he was relieved in November by Surgeon G. F. Turner. . . .

NOTE 2.—While these events were transpiring with the main army, a column of troops marched from Leavenworth, Kansas, to Sante Fé to occupy the territory of New Mexico. The medical officers who accompanied this expedition were Surgeon S. G. I. DeCamp, Medical Director, Assistant Surgeons J. S. Griffin and R. F. Simpson. In September a body of troops was collected at San Antonio, Texas, under command of General Wood, destined for the invasion of Chihuahua. Surgeon Lyman Foot was assigned as Medical Director of this Army, but was soon after relieved on account of ill health, and Assistant Surgeon C. M. Hitchcock, who was at the time Medical Purveyor at San Antonio, was appointed Medical Director, and Assistant Surgeon John C. Glen, Medical Purveyor. The latter was also placed in charge of the general hospital. This column consisted of portions of the first and second dragoons, fourth artillery and sixth infantry, besides Kentucky and Illinois volunteers. The other regular medical officers were Assistant Surgeon Josiah Simpson, in charge of the sixth infantry and Kentucky volunteers, and Assistant Surgeon W. Levely, in charge of the dragoons and artillery. There were also several volunteer surgeons and citizen physicians. They left San Antonio in the last week in September and marched to Presidio del Norte.

NOTE 3.—After the battle of Monterey, general hospitals for each of the divisions of the Army were established in that city. That at St. Joseph's Island was broken up and Surgeon Hawkins with the remaining sick and wounded removed to Matamoras. On the 24th of October, Surgeon C. A. Finley arrived at Monterey and by virtue of seniority relieved Surgeon Craig as Medical Director of the Army. About the middle of November the column under General Wood, which had been destined for Chihuahua, was ordered to join the main Army and arriving at the town of Parras was henceforth known as the Second Division of the Army of Invasion. Assistant Surgeon Hitchcock was detached from the division at Agua Nueva and ordered to Saltillo as Purveyor, Assistant Surgeon Josiah Simpson relieving him of his duties as Medical Director. This position the latter soon after relinquished to accompany the sixth infantry on its march to join Worth's Division, destined for Vera Cruz, and Doctor Hitchcock once more assumed its duties. About this same time the city of Tampico was captured by the naval forces, and immediately occupied by our troops under command of Colonel Belton. Of this command Assistant Surgeon John M. Cuyler was the chief medical officer.

NOTE 4.—The end of the year 1846 found the Army of General Taylor occupying Saltillo as its advanced station, with one division at Parras and the headquarters at Monterey. General Scott at this time was at Brazos Santiago organizing the ex-

pedition against Vera Cruz by way of Tampico and Lobos Island. For this purpose, in January Twiggs' division was detached from General Taylor's Army and ordered to Tampico, and Worth with his division to the mouth of the Rio Grande. On the 1st of February (as near as can now be ascertained) the following was the distribution of the medical officers serving with the Army: Surgeon P. H. Craig had again relieved Surgeon Finley as Medical Director of General Taylor's army, the latter having left the country on leave on account of his health. At Monterey the general hospital was in charge of Surgeon N. S. Jarvis, with Assistant Surgeon B. M. Byrn as his assistant. At Camargo, Surgeon Taylor was in charge of the purveying depot and Assistant Surgeon S. P. Moore of the post hospital. At Matamoras, the general hospital was in charge of Surgeon J. J. B. Wright, who had on duty with him Assistant Surgeons McPhail and Holden, and Assistant Surgeon J. F. Head in charge of the post hospital at Fort Brown. The general hospital at Point Isabel remained in charge of Surgeon R. C. Wood and Assistant Surgeon J. W. Russell. At Saltillo Assistant Surgeon C. M. Hitchcock was on duty as Medical Director of the Second Division, and Assistant Surgeons Madison, Lively and Prevost were attached to regiments. At Tampico, Surgeon B. F. Harney was Medical Director, Surgeon Satterlee was in charge of the garrison, composed of portions of the second, third and fourth artillery, and Surgeon Tripler was with the second infantry. Assistant Surgeons Cuyler, Mills, Steiner and Newton were also on duty with troops at this place. Surgeon Hawkins and Assistant Surgeons Simons and Edwards were on duty with General Taylor's Army at or near Monterey, and the following officers were either *en route* or under orders to join the forces which were to rendezvous at Lobos Island for the capture of Vera Cruz: Surgeons McLaren and Porter and Assistant Surgeons Suter, Laub, J. Simpson, De Leon, Barnes, Wotherspoon, Keeney and Roberts. These officers were changed so frequently from one regiment or hospital to another during the rapidly shifting scenes of the war that it is not possible now to give the exact duty to which each was assigned at any particular time; it is desirable, however, to place on record the names of those officers who took part in the victorious campaign, and hence the foregoing and other lists are given, imperfect as they may be in their details.



METHOD OF HAND-TO-HAND FIGHTING¹

BY LIEUTENANT BERNARD DESOUCHES²

THIS method was worked out to allow a soldier who had lost all of his weapons to rapidly put *hors de combat* an enemy soldier also disarmed, or who simply has a knife or revolver. Experience has shown that a disarmed man coming to blows in the trenches with a disarmed enemy soldier has almost always lost his head and confined himself to struggling uselessly, because he did not know any blows or holds which would have sufficed until someone came to the aid of one or the other of the adversaries. A method teaching the use of nature's weapons in every possible position is particularly necessary for the English soldier, always accustomed to use his fists and fight like a gentleman, not using any unfair blows. In a death struggle it is these blows, generally considered unfair, which should be used.

The method which we have established is not, of course, a complete system; for first of all it has to be short and simple, and of a nature to be used by anyone after a few moments explanation and a little practice. First of all, we should emphasize this fact: *Never use your Fists*. The fist is the least effective of nature's weapons. Especially without gloves it is practically impossible to put an enemy *hors de combat* with the fists. As a matter of fact, in the case of a soldier, the solar plexus is protected by the military equipment, and the most violent blow on the point of the chin has no other effect than that of cutting cleanly the skin on the fist, and that of the jaw of the adversary. Nature's best weapons are: *The Feet, the Knees, the Head, the Elbows*.

ATTACKS

1. As soon as you are within reach of your adversary, attack with a blow of the toe of the boot. The blow should be rapid and the foot should be instantly pulled back so that the enemy has no time to seize it. This blow should be delivered with the left foot when the adversary is guarding toward the left and vice versa. The vulnerable parts of the body to be aimed at are: The knees, the private parts, the stomach

¹The concern of the medical officer is primarily the repair of injuries received. His ingenious brothers of the line take care that the method of infliction is altogether up-to-date. We have seen the vogue of killing by rifle fire, the upsetting of mortality statistics by the increase of shell wounds and though statistics as to injuries by the "*armes blanches*" are not impressive, we know that in fixed warfare of the trench and fortification type there must have been a number of them consequent on trench raids and hand-to-hand attack. We have a knowledge of the mechanism of wounds produced by the usual implements of war, but the rules laid down in the attached notes show that in fighting at close range almost anything may be regarded as an offensive or defensive weapon. While wound classification will still fall under the older headings of "incised," "lacerated," "contused," etc., it is not without interest to know the method by which an unarmed man may overcome another who is armed or unarmed.—THE EDITOR.

²Interpreter, Second French Army Central School of Instruction.

and, if the enemy is leaning forward, the head. The best point of attack is the knee of the leg which is in advance.

2. If you are very close to your adversary, place your hands behind his shoulders, pull him violently toward you, at the same time giving him a blow in the face with the top of your head, or hitting him with your knee in the private parts, or again by putting your thumb in his eyes, or finally, you may stamp with your heel on his instep.

3. (a) If all of these methods of attack fail, place your hip behind his back and upset him by a violent blow of your arm under his chin. If the adversary is guarding to the right, use your right hip and vice versa.

(b) When the adversary is on the ground kick him with the toe or heel of your boot.

4. If it so happens that you are behind your adversary take him by the throat, or the shoulders, holding him at half arm's length to avoid a backward blow from his head, and then kick him violently in the bend of the knee at the same time pulling him backward with your arms. When he is down, kick him.

5. If you fall to the ground with your adversary, hit him with the elbows on the point of the jaw or in the stomach.

6. When you are on the ground and your adversary is on his feet, ward off his attacks with your legs. As soon as you can reach him, if he is guarding to the left, put your left foot behind his left foot and push him violently with your right foot placed against his left knee, while at the same time your left foot pulls your adversary's left foot towards you. As soon as he is down jump on him and use your elbows.

PARRIES

1. If an enemy attacks you with his feet, go toward him your leg bent at right angles presenting him the lower side of your thigh, hopping on your right leg if the adversary attacks with the right foot and vice versa. When you get into a clinch with the adversary, attack as indicated in Paragraph 3 of the attacks.

2. If the adversary gets hold of you from behind—

(a) Throw your head back violently, repeatedly hitting the adversary in the face.

(b) If this blow does not succeed, seize rapidly between your legs the foremost leg of the adversary and lift his leg up with all your strength to throw him off his balance, and then attack as indicated in Paragraph 3, (b) and 5 according to the position in which you find yourselves.

(c) If the adversary has lifted you off the ground, twist one of his fingers. He will then let go and this will allow you to attack.

3. When an adversary gets you by the throat, push his arms as violently as possible outward. To this end hit his left wrist violently with your left palm and hit his right wrist with the elbows and the head.

Such then are the common positions; but in whatever position you find yourself remember always that the best weapons are: The Feet, the Head, the Knees and the Elbows.

AGAINST AN ENEMY ARMED WITH A KNIFE OR REVOLVER

When attacked by an enemy with a knife or revolver one is quite evidently handicapped, but you may get out of the trouble if you act quickly and daringly. First, kick the adversary on the knee before he can stab you with his knife.

Then the best thing to do is to rush low at the adversary, and to ward off blows with the left arm crooked in front of your face.

1. If the blow comes from above as soon as the left arm has warded it off, pass your right arm under the adversary's right arm, seize him by the wrist and twist his right arm backward.

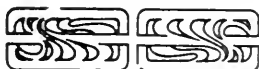
With the left hand bend the adversary's hand forward on the wrist or under to make him drop his weapon. Get hold of the weapon if possible or attack him with the knees on the head.

2. If the blow comes from below, ward off with the left arm bent over in front of the stomach, and hit the adversary's wrist. Then hit him rapidly with the knees on the head.

HOW TO MAKE A PRISONER ADVANCE WHO REFUSES TO WALK

Seize his right wrist with your right hand, place your left forearm, from the inside out under his right arm above the elbow.

To make him walk along raise the left arm, at the same time forcing down his right wrist with your right hand. The prisoner's palm should face resting upwards. This hold is very useful for night work.



EDITORIAL

THE MODERN PONCE DE LEON

"Les vieux fous sont plus fous que les jeunes."

Telegraph and telephone; phonograph, motion pictures, submarines and airships! And then Mr. Einstein to obliterate time and substitute an abstruse fourth dimension to puzzle those who cannot comprehend the three which bound our short career on this quarrelsome sphere. Following in the footsteps of progress is Professor Steinach with his hand on the clock of time to deny to old age the rest which it merits and insist that it revert to the duties of younger years.

Far be it from us to deny the validity of his deductions, for he is a hardy soul who shall declare any apparent fiction a figment of the imagination rather than a scientific reality. In the notes which follow we have a glimpse of the optimism of a German professor, Dr. Ludwig Levy of Berlin, who sees in Steinach's method unlimited possibilities, not the least of which is the rapid restoration of the population of Germany to the pre-war level.

We wonder whether the achievement of such a result would be the unmitigated blessing which he sees. Long ago the fateful words "tarry thou till I come" brought little recompense for the undue prolongation of the mortal span. Not to speak of the myth of Tithonus, Eugene Sue has built up a tale on this basis, as has the Rev. George Croly under the title of "Salathiel, the Immortal" and in neither is the boon of life everlasting compensation for the weight of years which leaves this waif of the ages to watch with weary eyes the march of the generations which always passes him. Of course Steinach does not propose any such eventuality in his scheme of glandular rejuvenation. He does assert however, that he can in this wise upset the process of nature to the extent that old age shall lose its peaceful serenity beset with no more active duties than the contemplation of past achievement in the vexatious problem of race suicide. What a turmoil we should be in if it came to the pass where it were a matter of perplexity as to whether grandpa or the debutante would be the better chaperon! Who would conserve the proprieties if these gay young blades of sixty and over were loose and eager with renewed appetites and all the wisdom born of past experience? We shudder to think of the possible untoward consequences. How about the prospective heritors who have counted so surely on the benefits to be secured by the "post obit" route, the anticipated inheritance? Then again, what would happen if some lusty young man in his golden twenties were furnished with an additional

supply of this marvelous glandular tissue? Would he become a super Don Juan, a magnified Turk, or would he lapse into the stage of early adolescence or possibly don again the ignominious triangular trousers of his first feeble years? The possibilities perplex and appal us. "Youth will be served." Why not also old age? Each has its appropriate duty and where there is an Æneas there must be, to complete the picture, a Priam to guide and direct his steps. Make of the elder another Æneas and we foresee nothing but trouble for them both, to say nothing of the additional cares and responsibilities to be assumed by Dido.

As for the rejuvenated rats—why, that is another matter altogether. The amours of the rats need not concern us to any great extent as an abstract question, although from the standpoint of strict materialism we deplore the additional industry which the application of this therapy, if we may so denominate it, would detail on our thorough and patient brothers of the United States Public Health Service in their war against the rodent. The rat himself is accustomed to having his cosmos turned topsy-turvy since the day when Paul Bert took such unpardonable liberties with his physiological tail and it is to be presumed that he would view with more or less equanimity any addition to his furtive years of sorrow. For us who walk upright in the broader paths of life and steer a more or less successful course for a definite term of years between the Scylla of matrimony and the Charybdis of frailty, it seems as though in the time of our setting sun we ought to be absolved of the necessity of following again the Primrose path which is for the feet of the young men to tread.

JAMES ROBB CHURCH.

The following is a report of a lecture by Dr. Ludwig Levy of Berlin on the subject of rejuvenation by the Steinach method:

The dream of all ages has come true; the elixir of youth has been found; the rejuvenation of mankind has become a scientific fact. Old men now may grow young again; unsteady hands once more be made strong and purposeful. Women can discard cosmetics with their wrinkles. There will be no more "old men's darlings," but their sweethearts in the world's passionate meaning; the retiring age of woman, that dreaded time when she must change from brilliant colors to sober black, purple, or gray, or become ridiculous, can be set back for another lustrum or two at least.

The cherished dream of humanity! Everlasting youth! men and women will gather experiences in their youth, and then go through a rejuvenating process to utilize their powers themselves. The sad story of old-young men belongs to the past, and of the women who have waited, waited until they have missed connections with their own romance.

The fairy tales of our nursery have become realities. In this age of submarines and airplanes the elixir of youth has been concocted! The Fountain of Youth has been transformed into an operating table; the fantastically garbed wizard, covered with cabalistic signs and symbols, has materialized into a university professor

with long whiskers, and blue eyes that sparkle kindly behind the thick lenses of his severe and prosaic eyeglasses. The enchanted place of mystery, where you pass in an old man and pass out a youth, is Vienna. Once the gay Vienna, the very city of rejuvenation where babies must starve, men go ragged, women have lost their sweet smile, where hunger stares out of every face, and hopeless desperation hovers above the panic-stricken streets.

Last month, in Vienna, printed on cheap, brittle newspaper, with hardly readable ink, appeared a slender pamphlet of 68 pages. It was accompanied by eight descriptive tables and illustrations and signed by "Professor Doctor Eugene Steinach." Here the professor put forth in simple words the results of his eight years of experimenting with the mechanics of evolution. Logically, like a spool of thread that unwinds before our eyes, he tells of his experiments with animals, later with men, still later with women, and at least twelve specifically enumerated cases of his patients, and with the astonishing result: "I can rejuvenate men and women; I can transform old people into young ones, not only in looks, in appearance, but I can restore them to all the glory of their youth, to their elasticity, their freshness, and vigor of mind, and I can restore them to their recreating faculties. I have ceased experimenting because all we need now is a large clinic actually to receive patients and do our work, and we have no more money for this purpose."

This Professor Doctor Steinach, who devoted fourteen years of his life to his studies, who undoubtedly made the greatest, most far-reaching, most humanity-benefiting discovery of all ages, says in his pamphlet: "Here are the results of my life's work. I am setting down all methods that proved infallible in my experiments. Every physician can perform my operation easily and without danger to the patient."

"Professor Steinach has given to the world his discovery without reservations. Every surgeon can perform the operation, every radio-expert can do as the professor did. Therefore, this method cannot be patented. And I believe it is the duty of humanity at large to show its gratitude voluntarily, not only to Professor Steinach, but to Vienna whence the new salvation emanates."

Steinach's first steps towards this marvelous result were taken when he found and proved that the courses of the sexual differentiation of men and women are not certain parts contained in the cell-producing organs, but that this function is exercised by certain cells which can be found lying in between these parts. There is an inner secretion caused by these cells which is responsible for the sexual differentiation and later on puberty. His predecessors had been successful in exchanging male and female glands in animals, transforming male animals, body and temperament, into female, and vice versa, female animals into male.

A further step of Steinach's was his successful operation on men who had lost their vitality, making them subjectly potent. Steinach experimented at first on rats, primarily because such experimenting was cheap and because rats are short-lived. He bred many perfectly healthy generations of rats, studied their normal life, succeeded in ascertaining that the term of their life is set at the outside at twenty-eight months. He studied carefully the beginning of their senility and their gradual decay. In order to be sure about each and every phase of the life of a rat, he had to study for almost five years nothing but rats. He found that the average rat shows the declining signs of senility in the twenty-eighth month of life. At this time he tried his simplest method of rejuvenation. After six weeks the animal seemed transformed; it gained in weight, the hair grew anew and was soft, the head erect when it walked, the eye clear; the quiet animal that seemed to have lost all interest

in its surroundings became vivacious, most interested in every detail of its surroundings; climbing as high as a very young rat after a piece of cheese, aggressive at once when a male rat was permitted to enter the cage, hot on the trail of the female rat the minute a female was admitted into the male's cage. Both took immediate possession of each other with more than normal youthful strength. This condition lasted from seven to ten months, life had been prolonged one-fourth to one-third of its normal duration; then set in a second senility and death.

In several cases a second rejuvenation (by method two of those enumerated below, also used in above cases) proved successful, but the first rejuvenation in each and every case.

The experiment was tried with equal success on dogs, goats, and cats, but unfortunately because of the intervening years of war no orang-utang, the most highly developed animal after the human being, could be secured from without Germany and Austria.

There are four distinct methods which cause rejuvenation: (1) Ligature of semen vessels at certain points; (2) complete detachment of the male or female cell-producing organs from their surroundings and a careful replacement; (3) the implanting of a juvenile cell-producing organ; and (4) exposure of these cell-producing organs to Roentgen rays after incision at certain modified intervals.

All four methods cause in the cell-producing organs the same visible results; production in abundance of all vital parts of the so-called puberty glands.

Only one method was used on each and every animal, and always the result was the same. Youth in appearance, and reproductive power. The second generation begotten by rejuvenated rats was not only healthy but also reproductive. All these experiments were repeated on humans, with the same excellent results.

Dr. Roux, Director of the Anatomical Institution of the University of Halle, the foremost authority since Virchow's death, met two old men, one of seventy-five and one of seventy-one, before and after their rejuvenation. Two months after the operation, their general tiredness, difficulty of breathing, and dizzy spells ceased. Mental capacities, like memory, quickness of mind, were restored. They not only looked fifteen to twenty years younger, but acted up to it. Their reproductive powers had been restored to them.

Dr. Levy-Lenz spoke of the effects of the operation on a working man of forty-four, who through the vicissitudes of the war and under-nourishment had declined physically and mentally. He was so weak that he could not work, hardly could walk. Two months after the operation he was restored perfectly. He became a long-shoreman and carried 140 pounds on his back.

Women were subjected to the Roentgen-ray methods. Their skin became soft, wrinkles disappeared from face and neck, they regained their physical strength, and became mentally elastic.

Dr. Steinach also operated on persons of homosexual inclination. He mentioned in particular a youth of twenty-five, a medical student, who from youth up had been inclined towards his own sex. He was treated under method 2 above, and his desires for the past four years have been directed as is natural.

It remains to be seen if a second rejuvenation will be possible and how long the first rejuvenation will last. It is two years since the seventy-one year old man was rejuvenated. For the past two years he appeared like a man of forty, lived like one and became the father of a son.

Dr. Levy-Lenz closed his lecture with a few remarks on how this discovery should help Germany in her rehabilitation and that the operation, if not successful in restoring youthful vigor, will be absolutely harmless.

ASSOCIATION NOTES
CONSTITUTION AND BY-LAWS OF THE ASSOCIATION OF
MILITARY SURGEONS OF THE UNITED
STATES¹

PREAMBLE

The Medical Officers of the Army, of the Navy, of the Public Health Service of the United States, and of the Organized Militia of the Different States, under the provisions of an act of Congress approved January 30, 1903, have associated themselves together under the name of "The Association of Military Surgeons of the United States." Now, therefore, pursuant to the laws of the United States, the members of said Association do hereby ordain and enact the following:

CONSTITUTION

ARTICLE I

NAME

The Association shall be known as "The Association of Military Surgeons of the United States."

ARTICLE II

OBJECT

The object of the Association shall be to increase the efficiency of the medical service of the Army, the Navy, the Public Health Service, and of the Organized Militia of the different States by mutual association and the consideration of matters pertaining to the medico-military service of the United States both in peace and in war.

ARTICLE III

MEMBERS

Classification of Membership

SECTION 1. There shall be Active, Life, Associate, Ex-Officio, and Honorary Members.

Members Eligible to Office and Entitled to Vote

Sec. 2. Active and Life members only are eligible to office or entitled to vote.

Sec. 3. Active membership is limited to commissioned medical officers of:

1. The United States Army;
2. The United States Navy;
3. The United States Public Health Service;

¹Adopted September 26, 1911.

4. The Organized Militia of the several States.
5. The United States Volunteers;
6. Ex-medical officers and
7. Acting Assistant Surgeons (Contract Surgeons) of the U. S. Army, Navy and Public Health Service.

Active members may retain their membership, should they be honorably discharged from the service in which they have been commissioned.

Life Members

Sec. 4. Life membership and exemption from payment of annual dues is conferred upon—

1. Members who obtain first honorable mention in the prize competitions of the Association.
2. Any active member upon the payment of fifty dollars at one time,
3. Ex-presidents of the Association.

Associate Members

Sec. 5. Associate membership is open to:

1. Other officers of the aforementioned services;
2. Ex-medical officers of the Confederate Army and Navy and
3. Medical officers of foreign services.

Ex-Officio Members

Sec. 6. The Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Public Health Service, in conformity with the Act under which this Constitution is adopted, shall be ex-officio members of the Association.

Honorary Members

Sec. 7. The President of the United States, the senior General officer of the Army, and the senior flag officer of the Navy for the time being, shall be honorary members. Other persons who have rendered distinguished service to the Association, or who have otherwise attained distinction deserving of recognition by the Association, are eligible to honorary membership.

ARTICLE IV

GOVERNMENT OF THE ASSOCIATION

Advisory Board

Section 1. There shall be an Advisory Board consisting of the Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the

Navy, the Surgeon General of the Public Health Service and the President of the Association.

Officers

Sec. 2. The officers shall be a President and three Vice-Presidents, who shall be elected from and represent in regular rotation the Army, the Navy, the Public Health Service, and the Organized Militia; a Secretary-Treasurer; all of which officers shall hold their respective offices until their successors are elected and qualified.

Executive Council

Sec. 3. There shall be an Executive Council, to consist of the officers and six (6) members, who shall be appointed by the President each year.

Committees

Sec. 4. There shall be the following committees, to be appointed annually by the President, except as hereinafter specified.

A Literary Committee, to consist of seven (7) members.

A Publication Committee, to consist of four (4) members, one of whom shall be the Secretary as ex-officio chairman.

A Necrology Committee, to consist of four (4) members.

A Committee of Arrangements for the next ensuing meeting, to consist of one (1) member, who shall be the chairman, with power to associate with himself such other persons, members of the Association or not, as he may see fit.

A Nominating Committee, based upon a representative or one vote for each State, Territory, the Army, the Navy, and the Public Health Service, and for every additional ten (10) members or major fraction thereof an extra representative or vote; said vote or votes to be cast by a member or members, present from each State, Territory, Army, Navy, and Public Health Service, to be designated by the members present from each State, Territory, Army, Navy and Public Health Service at the time of meeting.

A Committee on Legislation to consist of five members, one each from the Army, Navy and Public Health Service, and two members from the Organized Militia, to be nominated by the President and elected by the Association in annual meeting. (Adopted, Annual Meeting, Sept. 13-15, 1915).

A Sinking Fund Committee to consist of the President, who shall be Chairman, the Secretary-Treasurer, who shall act as Secretary and custodian of the fund, and three members to be elected from the former Presidents of the Association, the latter to hold office for three years. Those first elected shall select by lot who shall go out at the end of the first, second and third year respectively, and each year thereafter one

member shall be elected to the Committee at the annual meeting of the Association. Vacancies occurring in the interval may be temporarily filled by the Committee.

Boards of Award

Sec. 5. Boards of Award shall be appointed by the President for the consideration of such prize competitions as may from time to time be instituted by the Association. Membership in the Association shall not be required of members of the Boards of Award, which shall be selected in each instance from men conspicuous for knowledge of the subject of the competition.

ARTICLE V

SEALS, INSIGNIA AND ARMS

Seal

Section 1. The seal of the Association shall consist of a circle, one and three-eighths ($1\frac{3}{8}$) inches in diameter, charged with the cross of the insignia with the words, "Organized 1891, Incorporated by Congress 1903," within a circumferential band bearing the words, "Association of Military Surgeons, United States."

Insignia

Sec. 2. The insignia of the Association shall comprise (1) a Cross; (2) a Ribbon.

(1) The Cross shall be of gold, the obverse enameled with red and bordered with gold, upon which shall be superimposed a white shield, inclosing a shield of the United States in its proper colors—red, white and blue with stars of gold—surrounded by the motto, "Omnia pro Patriæ Caritate;" the reverse, plain gold and bearing its number. Upon the reverse may also be engraved the name and address of the owner. The cross, suspended by a ribbon, consisting of two bands of crimson inclosing a band of white, may be worn by any member of the Association on ceremonial occasions, and shall be carried on the left breast—or at the collar, if the wearer be an officer of the Association.

The Ribbon

(2) The ribbon to be worn with civilian dress shall consist of a piece of ribbon $\frac{3}{16}$ of an inch wide of the official colors of the Association, to be tied in the upper left-hand button-hole of the civilian coat and around the lapel with the knot to the rear.

The Coat of Arms

Sec. 3. The Coat of Arms shall be as follows: Quarterly. First: Sanguine, a caduceus or; for Army. Second: Or, an oak leaf and

acorn proper; for Navy. Third: Argent, a caduceus and an anchor in saltier azure; for Public Health Service. Fourth: Azure and argent, the Union as borne on the American Flag; for the Organized Militia.

Surcharged—The Badge of the Association, proper.

Crest.—An Eagle displayed, proper, bearing on breast a Geneva Cross.

ARTICLE VI

QUORUM

Thirty-five (35) members shall constitute a quorum for the transaction of business, but a less number may adjourn.

ARTICLE VII

AMENDMENTS

All amendments to this Constitution shall be proposed in writing at one annual meeting and voted on at the next. A three-fourths vote of all the members present at the annual meeting shall be necessary for adoption.

ARTICLE VIII

SINKING FUND

Such funds belonging to the Association as are not needed in current requirements shall be placed in the hands of a Committee to be known as the Sinking Fund Committee. The Sinking Fund shall be invested in Government or other bonds approved by the Committee, or deposited in an approved Trust Company until so invested and no money shall be withdrawn from this fund except upon a majority vote of the Sinking Fund Committee and of the Executive Council voting separately in session or by letter. When withdrawal is thus approved, it shall be made by an order on the Secretary-Treasurer signed by the President of the Association. The custodian (Secretary-Treasurer) of the fund shall be bonded in such sum as the Committee shall determine, and his accounts, and the securities and funds shall be audited annually and at such other times as the Committee requires.

BY-LAWS

ARTICLE I

ELECTION TO MEMBERSHIP

Active or Associate Membership

Section 1. Election to active or associate membership shall be by the Executive Council, to whom the Secretary-Treasurer shall refer all applications, together with such credentials as may be presented.

Honorary Membership

Sec. 2. Election to Honorary membership shall be by a two-thirds vote of the Association, after the unanimous recommendation of the Executive Council.

ARTICLE II

Expulsion from Membership

Any member who may be dismissed from the service for conduct unbecoming an officer and a gentleman, or who may be guilty of such conduct though then not a member of the service, shall be expelled and debarred from any further rights or privileges when proper proof has been furnished.

ARTICLE III

Meetings

The Association shall meet annually, the time and place to be fixed at each meeting for the one ensuing. Special meetings may be called by the President at any time. At the annual meeting the President, Vice-Presidents and Secretary-Treasurer shall be elected for the term of one year, the Executive Council and standing committees appointed, and the annual reports received.

ARTICLE IV

DUES AND FEES

Admission Fee

SECTION 1. The admission fee to be paid by active and associate members shall be five dollars (\$5.00), which shall accompany the application for membership. This shall include subscription to THE MILITARY SURGEON for one year.

Annual Dues

Sec. 2. The annual dues shall be one dollar (\$1.00), due on the first of January of each year. No annual dues shall be required of new members for the remaining portion of the calendar year in which their admission fees have been paid. Delinquency for one year shall terminate membership, after due notice by the Secretary-Treasurer. Provided that in the case of members who have resigned or have been dropped for non-payment of dues under Section 2 of this article, such members may be readmitted without payment of a second entrance fee and upon payment of delinquent dues.

Members Exempt from Dues

Sec. 3. Honorary, Ex-Officio, and Life Members shall be exempt from the payment of dues.

Official Journal

Sec. 4. The annual subscription to the official journal by members

of the Association shall be three dollars (\$3.00), payable in advance and the journal shall be stopped on expiration of unrenewed subscription.

ARTICLE V

DUTIES OF THE ADVISORY BOARD

The Advisory Board shall meet at such times as the interests of the public service may demand. Meetings may be called by one or more members of the Board and three members shall constitute a quorum. Any action taken by the Board shall be reported to the Association through the President of the Association.

ARTICLE VI

DUTIES OF OFFICERS

The President

SECTION 1. The President shall preside at all meetings, appoint all committees, unless otherwise provided for, approve all proper bills, and perform such other duties as are usually incumbent upon such an officer.

The Vice-Presidents

Sec. 2. The Vice-Presidents in order of seniority shall perform the duties of President in the absence or inability of that officer.

The Secretary-Treasurer

Sec. 3. The Secretary-Treasurer shall keep the minutes of the meetings, the records and archives of the Association; receive all applications for membership and refer them to the Executive Council; issue certificates of membership to active, associate, and honorary members on election, and to life members when the necessary fee has been paid; and shall hold office until his tenure is terminated by resignation or death, or by the election of his successor after due and timely notice.

He shall be a member and ex-officio chairman of the Publication Committee.

He shall appoint an Assistant Secretary each year.

He shall be editor of the official journal. He shall receive all moneys due the Association, collect all assessments, and pay all bills which have been properly approved, except as provided in Article X.

The accounts of the Secretary-Treasurer shall be audited by a committee appointed for that purpose on or before the annual meeting, and at such other times as the Executive Council shall require. He shall present an annual report in which he shall state the number of members for each Service in the following classes: Life members; Active members in good standing; Active members delinquent; resigned; died, and dropped under Article IV, Sec. 2, of the By-Laws. Said report shall

show all receipts, disbursements and outstanding debts of the Association.

Members in good standing shall be those who have paid all their annual dues at date of the last audit of the Secretary-Treasurer's account and none other shall be allowed to vote or be counted for votes in the annual or special meetings except by authority of the Executive Council, in each case where dues have been paid after that date. [Adopted, 1915 Annual Meeting.]

He shall be custodian of the Sinking Fund.

He shall execute such bond as may be approved by the Executive Council for the faithful performance of his duties, the Association to bear the cost of this insurance.

ARTICLE VII

THE EXECUTIVE COUNCIL

Duties

SECTION 1. The Executive Council shall be charged with the conduct of the affairs of the Association during the intervals between the annual meetings, shall elect active and associate members, and perform such other duties as may be assigned to it by the Constitution and By-Laws or by vote of the Association at any stated or special meeting. It shall temporarily fill all vacancies occurring among the officers of the Association between annual meetings.

Conduct of Business

SEC. 2. The business of the Executive Council may be conducted by correspondence or at such meetings as may be called by the chairman upon his own initiative or at the request of any three members. The Secretary-Treasurer shall keep a record of such correspondence and of the minutes of the meetings of the Council.

Officers

SEC. 3. The President and the Secretary-Treasurer of the Association, respectively, shall be ex-officio chairman and secretary of the Executive Council.

Quorum

SEC. 4. Five members of the Executive Council in meeting shall constitute a quorum for the transaction of business. In correspondence a majority of the whole Council shall govern.

ARTICLE VIII

DUTIES OF COMMITTEES

SECTION 1. The Literary Committee shall outline the literary work for the annual meeting in advance, making the necessary arrangements for the reading and discussion of papers.

The Chairman shall be responsible for the program for the ensuing meeting.

The Committee shall assist the Publication Committee in the prompt publication of the Proceedings.

The Publication Committee

SEC. 2. The Publication Committee shall have charge of the publications of the Association.

It shall determine what portions of the proceedings are of sufficient general interest to be printed and decide upon the advisability of publishing the several papers presented at the annual meetings, and such other matter as may be of value to the Association.

The Necrology Committee

SEC. 3. The Necrology Committee shall report to the Association, at each annual meeting, the deaths that have occurred during the preceding year among the members of the Association, with a suitable memoir in each case.

The Committee of Arrangements

SEC. 4. The Committee of Arrangements shall have charge of all local arrangements for the annual meetings of the Association.

The Nominating Committee

SEC. 5. The Nominating Committee shall, at the annual meeting, present a list of candidates for the various offices for the ensuing year.

The vote or votes of the Nominating Committee shall be cast by a member or members present from each State or Territory, the Army, the Navy, and the Public Health Service.

ARTICLE IX

DUTIES OF BOARDS OF AWARD

Boards of Award shall be charged with the selection of the person or persons to whom prizes shall be awarded, in accordance with the regulations of such prize competitions as may, from time to time, be instituted, and shall report the results thereof at such time as may be designated by the Association.

ARTICLE X

THE JOURNAL OF THE ASSOCIATION

The Association shall publish a monthly journal to be known as *THE MILITARY SURGEON*, in which shall be printed the proceedings of the annual meeting and such other matter as is determined upon by proper authorities. The cost of the journal shall be paid by an allotment of Association funds to be made on a budget submitted by the Editor and approved by the Executive Council.

The Secretary-Treasurer shall be ex-officio Editor of the journal and may appoint, with the approval of the Executive Council, such associate Editors and Collaborators as he finds necessary or desirable in conducting its publication.

He shall receive such monies accruing from subscribers, advertisers, and other sources pertaining to the journal as are sent to him; shall keep a business record of the same and deposit the money in a bank approved by the Executive Council, in the name of The Association of Military Surgeons of the United States, subject to his order.

He shall pay such bills as are due in connection with the journal, which have been approved by the President, or an officer of the Association designated by him, and shall render a monthly account to the President showing any unexpended balance remaining to his account at the end of each month.

The Editor shall be bonded in amount determined by the Executive Council and shall submit a report at the annual meeting of the Association, with a statement of his account duly audited by a certified accountant, to be designated by the Executive Council, and such other reports as may be called for by the Council.

ARTICLE XI

AMENDMENTS

All proposed amendments to these by-laws must be forwarded to the Secretary-Treasurer, who will present them to the Executive Council at least three months before the next annual meeting. The proposed amendments and views of the Council shall be published in the journal of the Association not later than one month before the annual meeting, at which meeting they may be adopted by a three-fourths vote of all the members present.

ARTICLE XII

ORDER OF BUSINESS

1. Reading of records of previous meeting.
2. Appointment of Committees.
3. Report of Executive Council.
4. Report of Secretary-Treasurer.
5. Report of Editor
6. Report of Standing Committees.
7. Report of Special Committees.
8. Unfinished Business.
9. New Business.
10. Literary and Social Program.
11. Election of Officers.
12. Installation of New Officers.

13. Reports of Committees.

14. Incidental Business.

15. Adjournment.

The parliamentary rules governing in the Congress of the United States shall be the standard of this Association.

At a meeting of the Executive Council of The Association of Military Surgeons, December 1, 1920, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Army

Major

Thomas Grover Orr

Captains

David Kimball Allen

Cyrus Rexford Baker

Victor N. Meddis

Clyde D. Oatman

Leroy D. Soper

First Lieutenant

Alberto G de Quevedo

Medical Reserve Corps, U. S. Army

Colonels

Richard Derby

John Baldwin Walker

Lieutenant Colonels

Joseph C. Beck

Henry A. Ingalls

Henry Monroe Moses

Majors

William H. Bailey

Harry John Corper

Edward L. Davis

Charles Warren Dixon

Duncan Patterson Dixon

James C. Dorr

Adolph J. Girardot

Thomas Everett Griffith

Frank Baker Hiller

Meyer Jedel

Harry G. Marxmiller

Robert Crichton Molison

Ernest Wesley Rimer

Medical Reserve Corps, U. S. Army

Captains

James L. Austin

James S. Bell

Carl Guille Brown

George Thaddeus Brown

John Milton Butler

Charles Cadwallader

John E. Campbell

George Hill Christy

Granbow Thomsen-von Colditz

William Louis Culpepper

Earl A. Davis

Charles Hunter Drake

Charles Spencer Edwards

Samuel S. Epstein

Leo Paul Gaertner

James R. Harvey

Fred Leo Hosman

Anders G. Hovde

Wesley J. Irvine

Fernando Heriberto Janer

Charles Albert Johnson

W. M. Johnson

John George McFadden

Earl Bert Miller

Roscoe P. Pierce

George Wylie Pirtle

Rudolf Rapp

Carl W. Robbins

John Hugo Schaefer

John K. Stewart

Clinton Daniel Swickard

Maxwell Lewis Volk

Martin Van Buren Waddle

John P. Williams

Millard E. Winchester

Robert Henry Woodruff

Melver Woody

First Lieutenants

James Antoneus Azar

Ewald George Baum

Otto I. Bloom

H. D. Cohen

Victor Giantieri

Willard Boyden Howes

Newton H. Jenkins

United States Public Health Service

Surgeon

Lon B. Moremen

Passed Assistant Surgeons

Elliott P. Smart

Clifford E. Waller

Assistant Surgeon

William Conrad Henske

Acting Assistant Surgeon

William Riley Brocksher, Jr.

BOOK REVIEWS

DIABETES A handbook for physicians and their patients, by Philip Horowitz, M.D. With twenty-seven text illustrations and two colored plates. New York: Paul B. Hoeber, 1920. Price, \$2.00.

In preparing this volume the author has acted upon the axiom that scientific accuracy in the prescription of diets and in their adjustment to the dietetic idiosyncrasies of patients, is the keynote to success in the treatment of diabetes. Instead of simply mentioning the various forms of food permissible under certain conditions the author has given in concrete form the daily regimen and has illustrated the treatment by detailed case reports. This treatment is built upon the supposition that the underlying causes of the weakened functioning of the pancreas is an intestinal toxemia, in the investigation of which the author is now engaged. He considers, in separate chapters, mild diabetes, moderately severe diabetes, severe diabetes, juvenile diabetes, hygiene and exercise, menus, recipes and tables, and tests.

The book is of handy size, well bound and printed in large, clear type.

FRANCIS M. MUNSON.

PUBLIC HEALTH LABORATORY WORK (Chemistry), by Henry R. Kenwood, C.M.G., M.B., F.R.S., Edin., D.P.H., F.C.S. Chadwick Professor of Hygiene and Public Health, University of London; Medical Officer of Health and Public Analyst for the Metropolitan Borough of Stoke Newington. Seventh Edition, with illustrations. New York: Paul B. Hoeber, 1920. Price, \$4.00.

In the new edition of this well-known book the author has dealt almost exclusively with the chemical branch of public health work as he considers that the growth of the range and importance of bacteriology in the work of the public health laboratory have rendered it no longer possible to deal with both subjects satisfactorily within the limits of one handy volume.

This is now composed of six parts entitled as follows: Part I, The Chemical, Microscopical, and Physical Examination of Water for Public Health Purposes; Part II, Sewage and Sewage Effluents; Part III, Soil Examination; Part IV, Air Analysis; Part V, Food Examination; Part VI, The Examination of Disinfectants.

This is a thoroughly practical and trustworthy laboratory manual. The previous editions have been used by laboratory workers for some years and the seventh edition will be a welcome addition to their libraries. The text has been carefully prepared, with a free use of bold-faced type and italics as an aid to ready reference. The illustrations are all that could be desired.

FRANCIS M. MUNSON.

THE AMERICAN RED CROSS IN THE GREAT WAR, by Henry P. Davison, Chairman of the War Council of the American Red Cross. New York: The Macmillan Company. 1920.

In this book Mr. Davison has set forth the scope, character and effect of the work of the American Red Cross during the great war. Every one of the thirty million Americans who were enrolled in the organization will feel the thrill of genuine pride when reading of its achievements. The author gives us many glimpses and some detailed descriptions of the multifarious activities at home and abroad of

"The Greatest Mother of Them All." Not the least interesting chapter is the last one entitled "The League of Red Cross Societies," in which is described the peace programme of the Red Cross provided for in Article XXV of the Covenant of the League of Nations.

The illustrations are most interesting, the frontispiece being a picture of the National Headquarters of the American Red Cross in Washington by Pennel.

FRANCIS M. MUNSON

A SHORT HISTORY OF NURSING, by Lavinia L. Dock, R. N. Secretary, International Council of Nurses. In Collaboration with Isabel Maitland Stewart, A. M., R. N. Assistant Professor, Department of Nursing and Health, Teachers' College, Columbia University, New York. New York and London 1920. G. P. Putnam's Sons. Price, \$3.50.

This handy volume has been prepared especially for the use of student nurses. Much of the material has been condensed from the four volumes of the larger *History of Nursing* by Nutting and Dock. Certain of the more recent developments are however found only in this volume.

In thirteen chapters and two appendices the authors have traced in a most interesting manner the history and development of nursing from ancient times to the World War. Among other aspects of the subject they dwell upon the influence of Christianity on the care of the sick, aristocratic and military influences in nursing, democratic and secular tendencies in nursing, the dark period in nursing, the work and times of Florence Nightingale, nursing in America and in other countries, extensions of the modern nursing field and recent educational developments. The type is large and clear and many references at the end of each chapter will serve as a guide to further reading on the subject. The book is admirably suited to the purpose for which it is intended.

FRANCIS M. MUNSON.

HYGIENE OF COMMUNICABLE DISEASES. A Handbook for Sanitarians, Medical Officers of the Army and Navy and General Practitioners, by Francis M. Munson, M. D., Lieutenant, Medical Corps, United States Navy, Retired; Lecturer on Hygiene and Instructor in Military Surgery, School of Medicine, Georgetown University; Formerly Instructor in Medical Zoology, Georgetown College; Late Brigade Surgeon, Second Provisional Brigade, United States Marines. Illustrated. New York: Paul B. Hoeber. Price, \$5.50.

In this timely manual the author has presented in a concise and readily accessible form the information now available concerning epidemiology and the management of the communicable diseases, ashore and afloat. With this end in view their various phases have been carefully separated so that the reader may quickly obtain the information sought on any particular point under all conditions of civil, military and naval life. Such a presentation of the subject will save the time of the physician, sanitarian, sanitary engineer, missionary, or medical officer and be of real, practical value to him when he is confronted with the danger or in the actual presence of any of the communicable diseases, whether in sporadic, endemic, or epidemic form. The sanitary measures and procedures indicated in various emergencies and under varying conditions are described in carefully headed sections, sub-sections, and paragraphs in a manner that will enhance the value of the book as a work of ready reference. New features are considered; sanitary measures following great disasters or example, have not heretofore been discussed in a textbook.

In Part II each disease is considered separately, and directions are given for its control. Particular attention is devoted to the insect-borne diseases, typhus, plague, yellow fever and malaria. In view of the present danger from these pestilences, the book will be especially valuable to physicians and sanitarians at this time.

The volume is a convenient size and will fit into the army medical field desk or the navy medical chest for small ships. The binding is very strong and is intended to resist hard usage in the tropics, in the field or at sea. The paper is excellent in quality and the typographical work of a very high order, free use being made of bold-faced type, small capitals and italics as an aid to ready reference.

JAMES ROBB CHURCH.

WOUNDS OF LUNG AND PLEURA, by Morelli. Translated by Davis and Irving. Boston: W. M. Leonard, publisher.

Davis and Irving had exceptional opportunity to observe the methods of Prof. Morelli while serving in Italy during the later stages of the Italian campaign and were convinced of the value of the method. Prof. Morelli's work was devoted exclusively to the treatment of wounds of the lungs and pleura and his methods are based upon the producing of an artificial pneumothorax similar to the treatment of pulmonary tuberculosis as devised by Prof. Forlanini.

The Morelli treatment is an application of the therapeutic pneumothorax treatment, modifying the technique to meet the special indications and adapting it to the treatment of wounds of the lung and pleural complications and sequelae. The translators were impressed with the results, especially as to its hemostatic value and the advantage of evacuating blood or effusions without compromising the collapse of the lung.

At the beginning of the war the concept that one should not intervene surgically in wounds of the lung, unless there was some special grave indication, was dominating and this belief is still held by many, but Prof. Morelli is convinced that intervention should be systematic and almost invariable in every wound of the lung. The translators are convinced of the far-reaching and beneficial effects of this method of treatment in controlling hemorrhage, lessening the dangers of infection and favoring healing and in consequence, lowering the mortality in this class of wounds.

To effect an artificial pneumothorax in a case with an open wound of the chest the wound is closed with specially devised elastic bags introduced into the wound and inflated, in this way closing the pleural cavity and allowing the production of an artificial pneumothorax.

Prof. Morelli advocates such surgical measures as control of hemorrhage from vessels of the chest wall or other large vessels which can be readily reached, and the removal of foreign bodies other than those imbedded in the lung, but he does not advocate the removal of missiles located in the lung unless there is some special indication, because they become encysted and then seldom cause symptoms.

He believes that a hemothorax is the worst possible way to effect compression and immobility of the lung and that a hemothorax should always be evacuated and a pneumothorax established.

A chapter is devoted to the treatment of empyema by a modification of this method. A thorotomy is performed, the pleural cavity irrigated, and then the rubber balloons are used to close the chest wound. These are made in such a shape as to surround a drainage tube which is connected to an apparatus which creates a negative pressure in the pleural cavity, thus aspirating continuously the pus and aiding in the dilation of the collapsed lung.

The book covers the variety, symptoms and treatment of wounds of the chest, pleura and lungs very thoroughly. The subject of the pneumothorax treatment with its technique, indications and results is covered in great detail and aided by many excellent illustrations which simplify the understanding of the text greatly. Finally, there is a chapter on case reports and results, also a comparison of the statistics of these wounds treated by Prof. Morelli's method with those obtained by following the expectant methods.

WALTER D. WEBB, M.D.,
Major U. S. A. Ret.

PRACTICAL VACCINE TREATMENT. For the General Practitioner. R. W. Allen, M.A., M.D., B.S., Late Captain, N.Z.M.C. New York: Paul B. Hoeber. 1920. Pp. 1-308. Price \$3.50.

In this well arranged and well written little volume the author discusses very thoroughly, and well, vaccine treatment and what may be expected from it in the prophylaxis and treatment of disease. Although obviously an enthusiast, Dr. Allen is generally very conservative in his treatment of the subject and the book contains a great deal of very valuable data not only regarding vaccine treatment but also regarding the relation of pathogenic organisms to disease and other data of interest to the epidemiologist.

The first four chapters of the book are devoted to a discussion of the manner of taking specimens for a vaccine, the preparation of vaccines, and the methods of administration and are excellent. The next chapter upon prophylactic vaccination contains some interesting remarks regarding the refusal of the Army Councils of some of the combatant nations during the great war to use a combined typhoid and paratyphoid vaccine, and the effect of this refusal, as illustrated in the Dardanelles Campaign, where typhoid occurred very rarely, over 90 per cent of the cases being paratyphoid fevers. When later the combined vaccines were adopted the paratyphoid fevers practically disappeared.

The sixth chapter of the book is concerned with the vaccine treatment of "carriers" and the author urges a much more extensive trial of this method of treatment and a more careful study of the results. Although his attitude is favorable to this method of treatment it must be confessed that the evidence he presents in this chapter as to its efficiency is very inconclusive and offers little hope of success in this direction.

The remainder of the book, comprising nine chapters, is devoted to vaccine treatment of various diseases and is thoroughly up-to-date and scientific in the handling of the subject. The reviewer believes that this book will prove to be a valuable help to the general practitioner in the use of vaccines for either prophylactic or therapeutic purposes, and can recommend it as a careful and conscientious presentation of the subject. The author speaks from a long and fruitful personal experience and what he has to say deserves the utmost consideration. While one may not agree with all that he claims for vaccine therapy, there is no question that vaccines have their place in the treatment, and particularly in the prophylaxis of infections, and this book contains an excellent summary of our knowledge concerning them. The work is well printed and bound and is remarkably free from typographical errors.

CHAS. F. CRAIG.

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GOVERNMENT REHABILITATION OF THE EX-SERVICE PERSONNEL OF THE WORLD WAR¹

BY SURGEON (R) J. G. TOWNSEND, U.S.P.H.S.,

Supervisor Fourth District

WHEN the Armistice was signed on November 11, 1918, it was an occasion for universal joy and celebration throughout the United States, for the greatest war in all history had terminated, with democracy, liberty, and justice prevailing over autocracy, militarism, and oppression. To accomplish this end, our country had given her resources, her manhood, and her dollars without reservation, her flag had emerged again undefeated, and the triumph of victory eclipsed all things else.

And yet we had our price to pay in killed and wounded, and in the reconstruction days that followed we were confronted with a gigantic task of physical rehabilitation, a task of bringing back to health and lives of usefulness thousands of ex-service men who had entered the Government service strong and healthy and had been discharged suffering from disabilities of varying degrees incurred in line of duty.

Good citizenship depends upon a healthy body politic, and to give every ex-service man or woman the best opportunities possible to regain the health lost and the physical handicap incurred while in the military service, and to effect a plan of rehabilitation, Congress passed the War Risk Insurance Act, which has been amended from time to time, the latest amendemnt being the Sweet bill which passed December 24, 1919.

This Act provides that "for death or disability resulting from personal injury suffered or disease contracted in the line of duty, by any commissioned officer or enlisted man or by any member of the Army Nurse Corps (female) or of the Navy Nurse Corps (female) when employed in the active service under the War Department or Navy Department, the United States shall pay compensation as hereinafter provided; but no compensation shall be paid if the injury or disease has been caused by his own wilful misconduct: *Provided*, That for the purposes of this section said officer, enlisted man, or other member shall be held and taken to have been in sound condition when

¹I am indebted to Mr. A. D. Hiller, Chief Statistician of the Bureau of War Risk Insurance for the statistical figures quoted in this article.

examined, accepted, and enrolled for service: *Provided further*, That this section, as amended, shall be deemed to become effective as of October 6, 1917." The Sweet Act changed this latter date from October 6 to April 6, 1917.

The compensation provided for is elastic, depending upon the extent of the disability and the number of dependents. For example, disabilities are classified as follows:

1. Partial.
 - a. temporary.
 - b. permanent.
2. Total.
 - a. temporary.
 - b. permanent.

While the disability is rated a temporary total, or, in other words, while the claimant is totally incapacitated for any work, but where an ultimate recovery is expected, the disabled person with neither wife nor child receives \$80 per month; if he has a wife but no child living, \$90; if he has a wife and one child living, \$95; etc.

Temporary *partial* disabilities are rated in amounts proportionate to the foregoing figures. For example, if a claimant is only disabled 50 per cent, and is single, he would receive \$40 a month, or half the temporary total rating.

A claimant is considered totally and permanently disabled for the rest of his natural life when, for instance, his disability is blindness in both eyes, loss of both arms or both legs, or one arm and one leg, or becoming helpless and permanently bedridden. In such cases, he receives \$100 per month for the rest of his life.

In case the *ill effects* of an injury or disease contracted in the service (which must here be distinguished from the injury or disease itself) do not appear until one year after discharge, the law provides that a *certificate of disability* must have been obtained from the War Risk within the year from the date of discharge, in order that compensation may be paid. However, if the *ill effects* of the injury occur in service, or within one year from date of discharge, the claim may be filed any time within five years from the date of discharge, irrespective of whether the claimant has a certificate of disability or not. If he *has* a certificate of disability and the *ill effects* occur after one year following discharge, he then has five full years from the beginning of the disability in which to make his claim. "Ill effects" may mean disability or death, and in the latter case, the relatives, of course, may make the claim.

Distinction should be made between War Risk Insurance proper and compensation for physical disability. Insurance is bought and paid

for by the service man like any other form of life insurance, but compensation is given by the Government of the United States without charge to the service man and is given regardless of whether War Risk insurance is carried by him or not. All benefits derived from compensation are in addition to any which may be due from War Risk insurance.

To the U. S. Public Health Service was given the work of the examination and treatment of the ex-service man, constituting, as it did, one of the greatest "after war" emergency measures with which the country was confronted. The work, in brief, is to make contact with the claimant, accomplish an examination, furnish treatment if necessary, either out-patient or hospital, and in the meantime supply the Bureau of War Risk Insurance with the examination report of disability upon which that Bureau bases the amount of compensation, which function is the exclusive right of the Bureau of War Risk Insurance. If the claim is disallowed by the Bureau of War Risk Insurance, treatment is given by the Public Health service until such time as disallowance is made.

The papers essential in establishing a claim for compensation and treatment are:

1. Form 526, formal claim for compensation.
2. Certified copy of discharge from service.
3. Adjutant General's record of disability, or in lieu of that, affidavits showing that disability was incident to service.
4. Physical examination report.

In order to make contact more readily with the ex-service man, and to effect examinations and treatments with the least possible delay, the Public Health Service decentralized the work in the United States among fourteen districts, each district comprising several contiguous States and being in accord, in general, with the geographical boundaries of the districts of the American Red Cross and Federal Board for Vocational Education. There are also district headquarters at Porto Rico, Philippine Islands, Hawaiian Islands, Virgin Islands, and the Canal Zone. These districts were placed in charge of commissioned medical officers of the Public Health Service known as District Supervisors, who are considered the field representatives of the Director of the Bureau of War Risk Insurance and the Surgeon General of the Public Health Service, and who operate under the conjoint direction of the Chief of the Hospital Division of the Public Health Service and the Assistant Director in charge of the Medical Division, Bureau of War Risk Insurance.

The organization of the District Supervisors' offices is according

to a uniform scale or plan, so conceived and constructed as to insure in district headquarters a smoothly running machine from the standpoint of keeping in touch at all times with the various claimants in the District, recording actions taken, and providing for the authority and checking of expenditures incident to the work at hand.

It is also vitally necessary to have an organization in the field, as well as a sound and stable organization at District headquarters, in order that the various sub-stations scattered throughout the District might the more promptly and properly "carry on" under the direction of the District office.

It was the policy of the Bureau of War Risk Insurance and the Public Health Service to establish in each county in every District an examining officer who would undertake the examination, and if necessary out-patient treatment of the claimants of the War Risk Insurance who would report to them from time to time for such action. In the smaller centers, or in localities where the soldier population was not heavy, there were placed on duty physicians in private practice who agreed to undertake this work on a fee basis, such fee to be paid by the Bureau of War Risk Insurance. In the larger centers and in the cities where the work would comprise more time, physicians were placed on duty as Acting Assistant Surgeons in the Public Health Service and given a part-time salary. When necessary, clerical assistance was furnished. In placing on duty these part-time officers, care was exercised to offer the positions, when possible, to those who had had military service during the world war, and to select as centers the county seats of the respective counties, or points to which railroad facilities extended. It also became necessary to establish in the larger centers hospital units consisting of a private hospital, with which contract was made on a per diem basis, and a corps of attending specialists in surgery, neuro-psychiatry, eye, ear, nose, and throat conditions and the like, these centers to be used as observation and temporary treatment stations, and in times of emergency. All reports of physical examinations and treatments, and in fact all correspondence pertaining to the work, is forwarded to the District Supervisor from the various field stations.

Contact with claimants in the respective districts is made in various ways: by news items in the newspapers, by the American Red Cross through its Home Service Sections, and through the help of the American Legion the ex-service man learns of his rights under the law, and the benefits which can accrue to him upon the establishment of his claim.

Upon receiving this information, he applies for instructions as to the method of procedure, and is advised that he must first make formal claim for compensation which he submits, together with a copy of his

discharge, to the District Supervisor or to the Bureau of War Risk Insurance direct. When the District Supervisor's office receives this claim, or when a physical examination is requested by the Bureau of War Risk Insurance to establish a claim, the claimant is immediately advised and transportation furnished when necessary to proceed to a certain examiner for a physical examination or to a hospital for observation to determine diagnosis. Government requests for meals are also furnished for use en route to the examiner. Upon the completion of the examination, return transportation to his home, and meals requests are furnished by the examining physician. Under the Act, he is also entitled to reimbursement for loss of wages incurred during such examination.

If the examination report is not received in a certain length of time and no reason is given for the claimant's not reporting, a second letter is written requesting the claimant to submit to such examination. If still no word is received, after a certain length of time a third letter is written, and if it seems impossible for the District Supervisor's office to make contact with the claimant, the help of the American Red Cross and the American Legion in the vicinity of the claimant's residence is solicited and all facts reported to the Bureau of War Risk Insurance. In other words, all possible efforts are made by the District Supervisor's office to make contact with claimants in his district. Upon the receipt of an examination report advising hospitalization, such hospitalization is provided, as is any form of treatment which may be necessary. The matter of special treatment will be discussed later.

There is therefore necessary in every district a section known as the Transportation and Notices Section, which has to do with the writing of these requests for examination, forwarding of transportation and meal requests and keeping at all times informed as to the status of each claimant who has been notified to report for examination.

It can readily be seen that a Files and Records Section in each District Supervisor's office is no small part of the office, for in this section are kept the records of every case communicated with, separate folders being kept for each claimant. In my own District, the Fourth, which comprises the States of Maryland, Virginia, West Virginia, and the District of Columbia, the work was not fully organized until October, 1919, and from that date until December, 1920, there have been filed in the neighborhood of thirty thousand cases. It is also necessary to keep a pathological index, or the record of every claimant by disease, which indicates at all times in every district, the number of cases by diagnosis observed in every state and in every locality, thus constituting the basis of an extensive vital statistics record which should be of

immense value both now and later on to State Departments of Health and the Public Health Service.

Limited authority has been given District Supervisors to authorize certain expenditures, hospital bills, fees for examination, prosthetic appliances, etc., so the third large clerical section in the district office of necessity is a Personnel and Accounts Section, which not only checks all expenditures, keeps records of amounts of money spent, renders monthly schedules of encumbrances, but is kept informed as to appointments and resignations of personnel and prepares all payrolls, checks, leaves of absence, etc.

The problem confronting the Public Health Service and the Bureau of War Risk Insurance, both actually and potentially, may better be realized by the fact that the number of men and women discharged from the Army, Navy, and Marine Corps to December 1, 1920, is reported as being approximately 4,020,000—every one a potential claimant of the Bureau of War Risk Insurance and a beneficiary of the Public Health Service.

The number reported as discharged on Surgeon's Certificate of Disability is 364,831. All of these may be considered claimants of the Bureau of War Risk Insurance. There were, of course, a large number of men discharged in apparently healthy condition who later developed a compensable disability, and there were a relatively large number of men who were discharged in unfit conditions, in order that they might be discharged to their families.

Of the total number of men accepted in the Army, Navy, and Marine Corps through induction, about 600,000 were accepted with physical defects which qualified them only for special or limited service. Furthermore, 213,500 men accepted by the local draft board were rejected at camps as unfit for military service. These men would be compensable only through an aggravation of their disabilities between the time they arrived at camp and were subsequently discharged.

From the number of ex-service men and women discharged to December 1, 1920, 519,816 have filed claim for compensation for disability with the Bureau of War Risk, or 12.9 per cent of the total number have filed claim, and from the present rate of claims being filed in the Bureau of War Risk Insurance, it is safe to presume that the claimants suffering from disabilities incident to military service are becoming more familiar with their rights under the law. As a matter of fact, the number of cases requiring examination and treatment are increasing as new claims for disability develop, and it is not expected that the peak will be reached for tuberculosis cases until at least 1923, while the peak for the neuro-psychiatric cases is not expected to be reached until 1926.

The average number of new claims received for the past five months at the Bureau of War Risk Insurance for compensation because of disability was 16,090 per month. The number received for November alone was 13,496. On December 1, 1920, of the total number of disability claims filed, 152,583 were reported active, 74,057 had been terminated, and 76,507 had been disallowed. At the present time, the amount of money being spent for compensation alone on the active claims awarded is approximately \$5,372,000 monthly. The number of examinations ordered by the Bureau of War Risk Insurance through the District Supervisor's offices to December, 1920, totals 596,758. This is somewhat in excess of the actual number of claimants who have filed claim, but this number includes reexaminations, as claimants are requested to submit to reexamination from time to time to determine the present status of their disabilities, which is necessary in a system where an elastic compensation is given. The average number of physical examinations requested by the Bureau of War Risk Insurance per month is approximately 29,000.

The above figures as given in gross will give what might be called a bird's-eye view of the situation *en masse*, of the activities along rehabilitation lines and the attempted adjustment of physical and financial difficulties since the passing of the War Risk Act.

All these medical cases automatically arrange themselves into three main groups, viz., neuro-psychiatric diseases, tuberculosis, and general medicine and surgery.

The estimated total neuro-psychiatric disabilities present in ex-service men directly traceable to military service is 76,588, this number being further classified as follows:

Injuries and disease, central nervous system.....	7,213
Endocrinopathies.....	4,823
Epilepsy.....	6,985
Psycho-neurosis.....	13,244
Insane.....	12,544
Inebriates, drugs, <i>et al.</i>	1,858
Feeble-minded.....	22,538
Constitutional psychopathic inferiority.....	6,609

The total number of physical examinations received by the Bureau of War Risk Insurance through the district offices for neuro-psychiatric disorders to December, 1920, was 36,731, while the average number of physical examinations submitted to the Bureau of War Risk Insurance per month on disabilities of this nature is approximately 3,085.

Since the passage of the War Risk Act there have been 15,788 ex-soldiers hospitalized for nervous and mental disorders, and on

January 1, 1921, there were 5,850 cases of this character in hospitals being treated as beneficiaries of the Government.

The whole neuro-psychiatric problem which confronts every community and nation, and which has always confronted the United States both as a State and National problem, has been greatly augmented by the late war. In numerous instances, boys who normally led quiet, unharassed lives in the far outlying districts, suddenly found themselves at training camps, amid new surroundings and scenes of activity never before experienced, were sent overseas, underwent the shock and stress and strain of modern warfare, and in the adjustment to pre-war conditions the reaction was too great, resulting in mental disorders of greater or less degree, which had been dormant for considerable periods, and probably never would have occurred under normal conditions of civil life.

I have personally interviewed, in my district work, cases giving this kind of history, and also, from time to time, epileptics who never experienced initial paroxysms until after their experience with the military forces. A great many potential cases of this type were pushed over the borderline by the stress and hardship of military life.

Besides the epileptics, hysterias, and mild neuroses, there is the problem of the frank insane. Cases of general paresis and locomotor ataxia, which invariably give a specific history much earlier in life, must be considered as beneficiaries of the War Risk Insurance entitled to compensation and treatment, for a man accepted for enlistment or by the draft must be technically considered as sound and well, and therefore conditions which develop in the military service as an after result of some previous infection are considered disabilities in line of duty. I have been interested in cases brought to my attention from time to time of general paresis developing in young men in the early twenties within a comparatively short time from a specific luetic infection. By short time, I mean from two to five years. It is possible that the mental strain and hypertension of mind, which only a war such as lately experienced could effect, is a primary factor in the early development of general paresis following luetic infections.

Dementia Præcox constitutes a large percentage of neuro-psychiatric cases, brought about by the large number of young men in service.

The Public Health Service has put into operation hospitals in various parts of the country for the treatment of special cases, which are generally classified as follows: Frank Psychoses, Epileptics, Psycho-neuroses, Functional Disorders (hysteria, neurasthenia, psychasthenia).

In the psycho-neuroses, milder forms of dementia præcox, and in certain cases of neurological conditions, occupational and vocational

therapy have been distinct aids. At Perryville, Maryland, and Waukesha, Wisconsin, occupational and vocational therapy is given by experienced physiotherapists under the supervision of competent neuropsychiatrists. When the claimant is able to leave the hospital, the same vocation which was given him as a therapeutic measure is continued, if deemed advisable, by the Federal Board for Vocational Education, provided he is mentally able to take such treatment. Out-patient treatment, in the form of hydro- and electro-therapy is given in various centers of the country, with experienced psychiatrists in charge.

The recent war has proved an ally to the Great White Plague, and as an aftermath, thousands of ex-soldiers have developed tuberculosis as a sequel to exposure, influenza, gas poisoning and various other factors due to military service. From the standpoint of health in communicable diseases, tuberculosis is the greatest single factor resulting from the war which confronts all health agencies. (It has been estimated that, up to December 1, 1920, 46,000 ex-service men have been discharged with tuberculosis.) The total number of these cases requiring hospitalization (and hospitalized) by the Public Health Service is 23,769, while the average number of new admissions to tuberculosis hospitals averages about 1661 per month.

The Public Health Service is doing its best with the means at hand to properly hospitalize the ex-service claimants who are suffering from tuberculosis, by the utilization to the utmost of Government-owned and operated hospitals, and to a limited extent, by using contract hospitals functioning in the various States.

In the past five months there has been an average of 2,688 examinations requested by the Bureau of War Risk Insurance for tuberculosis alone. Realizing the importance of this problem from the public health viewpoint, and in an endeavor to reduce to a minimum the contagion or infection from those cases that for one reason or another are not hospitalized, the public Health Service has prepared sanitary packets containing 2 large paper spittoons for emergency use, 25 hand paper cups, one metal container and 125 paper napkins, with instructions regarding the use of these and the prevention of the spread of tubercle bacilli. Each known claimant who cannot be sent to a hospital is furnished with one of these packets and advised as to where additional ones may be obtained. Claimants are also furnished this outfit at the time transportation is issued for hospitalization, for use on common carriers, in compliance with interstate quarantine regulations promulgated by the Secretary of the Treasury. The interstate travel of active tuberculosis cases from one section of the country to another

in search of climatic cures is a problem which confronts us in this work, for change of environment as a panacea for tuberculosis is anticipated and requested by a large majority of ex-service men. It is true that selective cases are sent to western and southwestern climates when it is honestly believed that such a procedure would be of benefit to the patient, but the promiscuous interstate travel for the sake of "going somewhere else" is discouraged, and claimants urged to accept hospitalization at the Government hospital nearest to their homes.

Much educational work relative to the tuberculosis problem is being carried on in our hospitals, and the claimant is at least given the advantage of knowing how tuberculosis is contracted, how spread, and the individual duty of each one to his fellow men and the country at large toward preventing the spread of this plague.

The general medical and surgical cases comprise a large group of disabilities, ranging from the slight disabilities to the more serious sequelae following wounds and injuries. This class comprises the great mass of out-patient treatments in local dispensaries, while the hospitals claim a no mean share of their quota from this type. Up to December 1, 1920, there have been 48,368 claimants hospitalized for general medical and surgical conditions. During November, 1920, the total number of new admission cards was 7,402, and a mean average of approximately 3,540 new admissions per month is maintained at all times.

It might be of interest to realize that the total number of artificial legs ordered by the Bureau is 2,933, the total number of artificial arms is 1,361, and upon the analysis of some 3,500 amputation cases it was found that the number of claimants who had lost both legs was 68. The total number reported as having lost both arms was 11. These more unfortunate cases, which must go through life handicapped in this way, are being supplied with the best artificial appliances available at the expense of the Government, and a number of them have taken advantage of the opportunity offered them by the Federal Board for Vocational Education, in learning new trades which will give them the same earning capacity, if not better, than was enjoyed before the disability was incurred. In cases of double, total permanent disabilities, such as loss of both arms and legs, or both eyes and both arms or hands, total permanent rating is given for both permanent disabilities. In such cases claimant receives \$200 per month.

The dental work is of vital importance, due to the recognized relationship between general systemic conditions and dental caries as foci of infection. Claimants who suffered from dental disabilities as a result of the late war are entitled to the benefits in the same manner as

those suffering from general medical handicaps. From July 1 to December 1, 1920, 11,495 dental examinations were forwarded to the Bureau of War Risk Insurance.

As a brief résumé of the general pathological conditions resulting from the war, there follows an index of 564,636 examinations under 27 general groupings. These cases are those reported as out-patients and not in need of hospitalization, although it is safe to presume that many of this number are now receiving hospital care:

<i>Class</i>	<i>No.</i>	<i>Per Cent</i>
1. Abnormalities and congenital malformations.....	447	0.08
2. Diseases of the blood.....	465	0.08
3. Diseases of the bones and cartilages.....	3,662	0.65
4. Diseases of the bursae.....	884	0.16
5. Diseases of the circulatory system.....	37,889	6.62
6. Diseases of the digestive system.....	57,353	10.16
7. Diseases of the ductless gland and spleen.....	3,874	0.69
8. Diseases of the ear.....	19,106	3.38
9. Diseases of the eye and annexa.....	22,953	4.07
10. Hernia.....	12,969	2.30
11. Communicable diseases.....	11,076	1.96
11a. Tuberculosis.....	74,029	13.11
12. Injuries (wounds, etc.).....	109,898	19.46
13. Diseases of the joints.....	29,041	5.14
14. Diseases of the lymphatic system.....	1,290	0.23
15. Diseases of the mind.....	10,863	1.92
16. Miscellaneous diseases and conditions.....	22,406	3.97
17. Diseases of the muscles, fasciae, tendons and tendon sheaths..	3,030	0.54
18. Diseases of the nervous system.....	25,868	4.58
19. Parasites.....	2,225	0.39
20. Poisonings and intoxications.....	3,845	0.69
21. Diseases of the reproductive organs.....	6,237	1.10
22. Diseases of the respiratory system.....	71,501	12.66
23. Diseases of the skin, hair and nails.....	5,793	1.03
24. Tumors.....	1,753	0.31
25. Diseases of the urinary organs.....	8,129	1.44
26. No disease.....	6,679	1.18
27. Undiagnosed.....	11,671	2.10
Total.....	564,636	100.00

Eighty-two thousand one hundred and forty-one hospital cases have been subdivided into 25 groups according to general diseases, which it is believed will be of interest, and the table showing this division is quoted below:

<i>Class</i>	<i>No.</i>	<i>Per Cent</i>
1. Abnormalities and congenital malformations.....	61	0.07
2. Diseases of the blood.....	75	0.09
3. Diseases of the bones and cartilages.....	761	0.92

<i>Class</i>	<i>No.</i>	<i>Per Cent</i>
4. Diseases of the bursae.....	65	0.08
5. Diseases of the circulatory system.....	3,018	3.67
6. Diseases of the digestive system.....	10,249	12.48
7. Diseases of the ductless glands and spleen.....	505	0.61
8. Diseases of the ear.....	1,468	1.79
9. Diseases of the eye and annexa.....	1,521	1.85
10. Hernia.....	2,391	2.91
11. Communicable diseases.....	5,614	6.83
11a. Tuberculosis.....	19,039	23.18
12. Injuries (wounds, etc.).....	5,545	6.75
13. Diseases of the joints.....	2,523	3.07
14. Diseases of the lymphatic system.....	206	0.25
15. Diseases of the mind.....	8,294	10.10
16. Miscellaneous diseases and conditions.....	3,721	4.53
17. Diseases of the muscles, fasciae, tendons and tendon sheaths..	247	0.30
18. Diseases of the nervous system.....	5,543	6.75
19. Parasites.....	422	0.51
20. Poisonings and intoxications.....	244	0.30
21. Diseases of the reproductive organs.....	1,203	1.48
22. Diseases of the respiratory system.....	7,078	8.62
23. Diseases of the skin, hair, and nails.....	492	0.60
24. Tumors.....	362	0.44
25. Diseases of the urinary organs.....	1,494	1.82
Total.....	82,141	100.00

It is impossible in a brief article to cover satisfactorily a subject so vast and so important as this one presents, or to give it justice, comprising as it does physical rehabilitation of hundreds of thousands of young citizens who must take their places in the affairs of the nation, and "carry on" as nearly as possible as if no war had intervened to handicap their activities and national worth. The expense incident to accomplishing this end is a national investment well worth while and in years to come will reap results which at the present time, in this era of economy, may not be apparent.



GENERAL HEALTH CONDITIONS AND MEDICAL RELIEF WORK IN ARMENIA

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(Four illustrations and one map)

THE problem of the economic reconstruction of Armenia has already been brought to the legislative and philanthropic attention of the people of the United States. It is believed that it would be of interest to the readers of *THE MILITARY SURGEON* to know something of the general health conditions prevailing in Armenia and what has been accomplished since the armistice along the lines of medical relief work.

The only agency working along these lines in Armenia is the Near East Relief, Caucasus Branch, which came into existence September 10, 1919, through the initiative of Colonel William N. Haskell, U. S. A. It was a consolidation of two then existing agencies for relief work in Transcaucasia, principally in Armenia, the American Committee for Relief in the Near East and the American Relief Administration. Colonel Haskell, who had very successfully conducted the American Relief Administration activities in Roumania after the conclusion of the armistice, was asked by General Bliss of the American Peace Commission, and Mr. Hoover, of the American Relief Administration, to organize a military mission to proceed to Armenia and administer relief work there. To facilitate the work the Peace Conference made him Interallied High Commissioner to Armenia. In addition to performing the diplomatic duties devolving on him as Interallied High Commissioner, Colonel Haskell was also appointed Director General of the Near East Relief, Caucasus Branch, and through the efforts of this organization a monthly budget of \$500,000 was granted for general relief work in Armenia. The personnel carrying on the work consisted of twenty officers, both temporary and regular, of the United States Army, and a force of about seventy-five civilians, consisting of both male and female relief workers, nurses, orphanage workers and chauffeurs.

The purpose of the organization, primarily, was that of food relief. While this subject is touched on in its relationship to the medical relief work inaugurated and maintained, it is with the latter phase of the relief work that this paper deals.

As Director of Medical Relief, Near East Relief, Caucasus Branch, an opportunity was afforded me, through personal observation and through access to sanitary and morbidity reports from all Armenia, to examine the health conditions of the population, with special regard to the wel-

fare of the children and to the problem of nutrition of the general population. Since it is hard to generalize upon the health conditions of a whole population in normal times, it can readily be appreciated how difficult the task is after a period of five years of the havoc wrought by the destruction and devastation of war, with its accompanying famine, starvation and virulent epidemics, together with the constant shifting of the population. Broadly viewed, the object of this paper is to acquaint the readers of *THE MILITARY SURGEON*, with the health of the population under the nutritive and physical conditions which existed during and since the end of the Great War; the results of the food and medical relief furnished by the Near East Relief, Cascasus Branch; what changes might be desirable in the character and manner of feeding, and the practicability of instituting other measures to reinforce the general health conditions.

It should be stated that out of four and three-quarter-millions of Armenians living in Turkey and Russia at the beginning of the war, less than three millions remain at the present time. It is estimated that as a result of binding themselves unreservedly to the Allied cause, one million men in Turkish Armenia alone lost their lives by either massacre, starvation, or deportation. Probably three-quarters of a million more perished as a result of disease and of epidemics of cholera, typhoid, dysentery, typhus, influenza, and relapsing fever, which were prevalent over practically all of both Turkish and Russian Armenia in the years 1914, 1915, 1916, 1917, and 1918. This resulted from the constant shifting of the population brought on by war conditions and the influx of the Turkish Armenian refugees, with the resultant overcrowding, undernourishment, starvation and almost total lack of medical attention. A factor of prime importance in the present devastated condition of Armenia and the disorganization and paralysis of agriculture, industry and commerce was the fact that for five years this area constituted the greater part of the Russian-Turkish battle front.

Before entering on the subject of food relief, it should be stated that approximately 2,000,000 people reside in what was formerly known as Russian Armenia and what is now known as Armenia. A great many, approximately 300,000, are refugee Turkish and Oriental Armenians who will no doubt ask for repatriation when boundary lines are definitely fixed. Probably more than one-third of the present population is other than Armenian. For practical purposes the present population may be classified as follows:

Armenians.....	1,290,000
Georgians, Russians and Greeks.....	65,000
Tartars.....	337,000

Turks.....	61,000
Kurds.....	75,000
Izides.....	38,000
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Total.....	2,062,000

For food relief purposes, the Armenians may be classified as follows:

Russian.....	467,761
Armenian Army.....	30,000
Refugee Russian Armenians.....	58,300
Native Poor Russian Armenians.....	365,665
Refugee Turkish Armenians.....	284,974
Refugee Oriental Armenians.....	39,300
Refugee Turkish Armenians (From Van District).....	6,000
Orphans.....	35,000
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Total.....	1,296,000

The reports of relief activities carried out in the districts and consolidated monthly at headquarters show that the Near East Relief, Caucasus Branch, is furnishing food relief to approximately 561,870 persons, through bread and flour distribution to adults and through the child-feeding program which includes the orphanages, child hospitals, soup and cocoa kitchens, and milk distributing stations.

The question of food supply naturally bears the most intimate relationship to the state of nutrition of the general population and in consequence to the general health of a people. A consideration therefore, of the quantity and variety of food available should be of interest.

In a general way, an average of 14,000,000 pounds of cereals, (chiefly flour), and 1,000,000 pounds of other food-stuffs, as milk, cocoa, sugar, beans, bacon, rice, corn, etc., are imported monthly from abroad and issued by the Near East Relief, Caucasus Branch. From this supply together with such supplementary native products as are available, the nutrition of about 500,000 people must be secured. Obviously, the food supply is considerably lower than the actual necessities of nutrition. It is, therefore, chiefly with regard to the efficiency and continuance of this supply and the effect on the nutrition of the population, that this inquiry has been directed. It must be stated directly that even with these supplies, the people have only barely existed. As much as possible has been done with supplies on hand to balance the protein, fat, and carbohydrate of the ration issued, but the almost total lack of animal protein and fat is a matter of great concern.

In accordance with the policy of the Armenian government, flour is intended for gratuitous issue to the army, the poor, refugees, orphans

and hospitals. The following table gives the standard bread and flour ration, with its caloric value:

Standard Bread and Flour Ration—Daily Allowance (Supplemented by Native and Other Food Products)

Class	Flour		Bread	
	Pounds	Calories	Pounds	Calories
Army.....	1.00	1,673	1.33	1,581
Refugees (working).....	1.00	1,673	1.33	1,581
Refugees (not working).....	0.50	836	0.66	891
Orphans.....	0.50	836	0.66	891

In general, there can be no doubt that the vitality and resistance of the majority of the population has been considerably lowered, making them an easy prey to epidemic disease. Specifically the population shows no acute tendencies, except for the prevalence of certain food deficiency diseases among the general population which are being gradually eliminated, and an increase in malaria and tuberculosis. Practically all the Armenians living along the lower portion of the Araxes Valley have malaria. Due to the undernourishment and impoverished condition of those who have suffered from this disease it has shown a great tendency to relapse. While there are no available statistics, the general medical reports show that tuberculosis is considerably on the increase. The factor that concerns us most here is the question of lowered vitality, due to undernourishment; but it is believed that as conditions become normal, the unaffected individuals will, with more liberal nourishment, gradually return to their former condition of health.

Conditions of health in normal times vary greatly in all countries between different economic and social classes. The present economic and political situation in Armenia, while not sharply accentuating these class differences, nevertheless requires a discussion of the situation class by class. For this purpose we may divide the population into the following classes:

1. Upper Classes: Government Officials, Professional Men, Wealthy Commercial Class.
2. Agriculturists, Tradespeople, Industrial Class, Minor Government Employees and so-called Native Poor.
3. Refugees.

1. UPPER CLASSES

This class in any country is the last to suffer in a food emergency, and may be dismissed at once with few exceptions as having benefited physically from enforced economy rather than having suffered any ill effects from malnutrition. This class numbers approximately 60,000, or roughly 5 per cent of the total Armenian population.

2. AGRICULTURISTS, MINOR COMMERCIAL AND GOVERNMENT EMPLOYEES, INDUSTRIAL CLASS, AND SO-CALLED NATIVE POOR

When one examines this class, dependent for livelihood upon commerce and industry which has been paralyzed for four years and upon agricultural pursuits which cannot be followed for lack of seed grain and the necessary implements, one finds the general health far below the average. In any event, its present status is only maintained by the extensive organization of food relief and protective measures operated by our organization.

Practically all the members of this group are partly dependent on the Near East Relief, Caucasus Branch, with the possible exception of the minor Government employes, for whose benefit, on account of their insufficient salaries, the Government maintains commissaries where it is possible to buy some of the food essentials at reasonable prices. This class as a whole suffered severely from the various epidemic diseases, as cholera, typhus, relapsing fever, and dysentery, which prevailed from 1914 to 1919, and there can be no doubt that this group furnished an increased incidence to both malaria and tuberculosis as a result of the undernourishment and lowered vitality that prevailed during those years. This class at the present time, as a result of the relief already afforded, presents no acute tendencies so far as the general health is concerned, and with a resumption of commerce and industry, and a supply of seed grain, in order that the crops may again be harvested, should, with a continuance of the relief work, as these things are realized, gradually approach a normal physical condition.

This class numbers approximately 800,000, or roughly 60 per cent of the total Armenian population.

3. REFUGEES

This class comprises the refugee Russian, Turkish and Oriental Armenians, whose lot has been very hard. Driven from their homes by the vicissitudes of war, they have constituted the shifting part of the population. Unwelcome in most communities, due to the lack of food and crowded conditions, without money, without friends, and with no available work, they have suffered acutely and intensely and furnish

the greater part of the mortality list from both epidemic disease and starvation. At this time it may be said that with refugee camps organized in all districts, where they regularly receive food and medical relief, with an opportunity to bathe and keep clean, and in many instances the opportunity to work, they are gradually regaining their self-respect and a different perspective on life.

As to the health conditions among this class, it may be said that only the hardiest have survived. While at the present time no acute tendency to disease has manifested itself, it is only through the present extensive organization for both food and medical relief that this state can be maintained. From a medical standpoint the incidence of tuberculosis has tripled in this group. Most of them present evidence of slight to severe secondary anemia. Their physical condition, however, is improving month by month. With the continuance of food and medical relief and with the decreasing danger of epidemics, it is believed that the majority of the group are in a generally fair state of health. A great many, no doubt, of the Turkish and Oriental Armenians will ask for repatriation when boundary lines are definitely fixed, and this will greatly diminish the congestion which exists at present. This class numbers approximately 450,000, or roughly, 35 per cent of the total Armenian population.

CHILD WELFARE

Since the inauguration of relief work in the Caucasus, the question of child welfare, both from the standpoint of nutrition and health, has played a very prominent rôle in our work. The present organization for child welfare with its multiplicity of activities, particularly along food and medical relief lines, has developed gradually from the work originally started in the orphanages and orphanage hospitals. Recently there has been given to the organization the Commonwealth Child Fund of \$750,000, to be devoted exclusively to the feeding of children. There have already arrived in connection with this fund an entire boatload of child-feeding supplies.

At the present time we are furnishing food and medical relief to 75,000 children daily, this work being done through the medium of orphanages, orphanage hospitals, soup kitchens, cocoa kitchens, milk stations, bread distributing points, orphanage infirmaries, and public dispensaries.

The following institutions, devoted to the promotion of child welfare, are being operated and maintained throughout the various districts of the Near East Relief, Caucasus Branch.

<i>Institution</i>	<i>Number</i>	<i>Number of Children Cared for Daily</i>
Orphanages.....	82	20,824
Soup kitchens.....	47	46,707
Cocoa kitchens.....	7	
Milk Stations.....	4	400
Orphanage Hospitals.....	23	4,000
Orphanage Infirmaries.....	80	2,000
Public Dispensaries.....	44	1,000

PHYSICAL CONDITION OF CHILDREN CARED FOR

This question has already been discussed in a general way in the conditions of health existing in the different economic and social classes in which these children naturally group themselves. Specifically, though when the work was first started last fall, practically, all the children cared for were undernourished and from five to fifteen pounds underweight. All presented evidences of either slight or severe secondary anemia.

Unquestionably, a great many children developed tuberculosis who, if properly nourished throughout the period under discussion, could have successfully combated the disease. The type of disease most commonly noted was the glandular. While no accurate statistics are available, it is no exaggeration to state that this type (Tuberculous Adenitis) increased fivefold. Bone and joint tuberculosis was quite common also, and was, after Tuberculous Adenitis, the most prevalent type seen.

Owing to the scarcity of essential foodstuffs to properly balance the diet before the inauguration of our present child-feeding program, scurvy, malnutrition, nephritis, and night blindness were much in evidence.

A discussion of the means taken to eliminate these diseases will be found under the heading, "Prevailing Diseases," subheading, "Deficiency Diseases."

The most prevalent skin diseases are favus, scabies, and impetigo. It is believed that as a result of the child-feeding program already inaugurated, the children to whom we are at present affording relief are on the way to a normal physical condition. There can be no doubt that with the work already accomplished, the Commonwealth Fund will permit of the necessary expansion and continuation of the child-feeding program to insure every Armenian child being placed in a normal state of health and nutrition.

MEDICAL RELIEF WORK

The Director of Medical Relief was charged with the coordination and supervision of all medical relief activities. The Office of the Director of Medical Relief for purposes of administration was divided into four sections: Hospitalization, Sanitation, Medical Supplies, and Laboratory.

The territory over which the Near East Relief, Caucasus Branch, extends operations is divided into the districts of Batoum, Borjom (Alhaljalaki), Baku, Tiflis, Karaklis, Alexandropol, Kars and Erivan. The boundaries of these districts are fixed by the Central Office in Tiflis. The map of Caucasia—shows the location and limits of the various districts. The general supervision of all relief activities in the district is exercised by a representative of the Near East Relief designated as District Commander.

The District Physician is on the staff of the District Commander and is responsible to the District Commander for the efficient operation of all the hospitals within the district and the conduct of all medical relief work. It has been our good fortune to have American doctors acting in this capacity in the more important districts and these doctors, with the American nurses assigned them for duty have contributed greatly to the success that may be ascribed to medical relief work.

Table Showing Hospital Expansion, Near East Relief, Caucasus Branch, Since its Organization, Sept. 10, 1919

	1919				1920						
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
Hospitals operated.	10	17	21	26	39	40	39	39	35	30	22
Total bed capacity.	785	3,177	3,356	3,959	5,060	5,681	5,609	5,524	4,924	4,521	4,170
Average daily number patients . . .	1,119	2,946	3,347	3,210	4,625	5,328	5,435	5,326	4,861	4,206	3,821

The Near East Relief, Caucasus Branch, possesses the only adequate hospital facilities in Armenia, and practically all of the population are dependent upon it for medical relief. Our organization, so far as hospitalization was concerned, was very fortunate in possessing, in most of our district headquarters and larger centers, old Russian military barracks of substantial stone construction. While in most instances the roofs and window sash were missing, as a result of a wanton destruction on the part of the Turks, we were able, in most instances, to thatch the

roofs with straw and place oiled paper over the old window frames. While these measures did not make these buildings ideal for hospital purposes, they did make them fairly habitable. Our hospitals functioned under the supervision of both American doctors and nurses, with the hospital staffs made up entirely of native personnel. The professional work done was, on the whole, of a very high order.

That a great need exists for these hospitals is evidenced by the fact that they operate to capacity practically all of the time. During the month of February, 1920, to give an idea of the work they were doing, they may be classified as follows:

Refugee Hospitals (General Hospitals).....	11
Orphanage Hospitals.....	11
Receiving Hospitals.....	5
Communicable Disease Hospitals.....	5
Communicable Skin Disease Hospitals (Favus and Scabies).....	7
Communicable Eye Disease Hospital (Trachoma).....	1
Total.....	40

Receiving Hospitals exist in each district where orphans before admittance to local orphanages are bathed, deloused, and receive clean clothing, and are isolated for communicable disease for a period of ten days. The other hospitals listed function as their names indicate.

For medical relief work among that part of the population not needing hospitalization, public dispensaries are maintained in all the districts. These function under the supervision of the American doctors and nurses, but the professional work is done entirely by native personnel. Both medical attention and drugs are furnished without charge.

Table Showing Total Number of Dispensaries in Operation and Average Daily Number of Cases Month by Month—Near East Relief, Caucasus Branch, Since Its Organization, Sept. 10, 1919.

	1919				1920						
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
Number dispensaries operated.....	7	10	17	30	27	52	44	44	42	38	34
Average treated daily.....	1,200	1,324	1,950	1,734	2,556	3,830	4,066	4,121	3,926	3,721	3,621

In addition to the Orphanage Hospitals and Public Dispensaries in each district, there is in each orphanage, in charge of a native nurse, an

Orphanage Infirmary, which is used for treatment of ambulatory cases not requiring hospitalization. The orphanage infirmaries are supervised and attended daily by an orphanage physician who conducts sick calls and makes a sanitary inspection of the Orphanage reporting sanitary defects if any are found, direct to the Orphanage Manager.

The Alexandropol, Erivan, and Tiflis districts provided dental treatment for employed personnel and inmates of our institutions. On June 1, 1920, six dental surgeons were being employed who were treating an average daily number of 350 patients. It was desired to establish an adequate dental service in each district but this was not practicable, on account of lack of dental supplies.

The question of medical supplies, until quite recently has been a vexed one, this being due chiefly to two reasons, first: the expansion of medical relief work moved more rapidly than our available medical supplies warranted, and secondly, the fact that our supplies were based on American requirements and not on those in existence in the Caucasus. The armamentarium of the native physician is considerably different than that of the American. The essentials in medicines and surgical dressings were at all times supplied where they were most needed, with the exception of the one drug, quinine. Generally, however, only essentials could be secured and these often only in limited quantities. There was a great lack of hospital equipment during the period from September to March. On the 1st of April, 1920, the long-delayed arrival of a boat-load of medical supplies, including drugs, surgical dressings, hospital equipment and clothing, enabled us to equip all our existing institutions in a thoroughly modern manner, allowed for further expansion, and left us enough reserve for the continuance of our work. This gift, made possible through the munificence of the American Red Cross, arrived at a very opportune time and enabled us to meet the immediate requirements of two neighboring republics, Georgia and Azerbaijan, which were in dire need of medical supplies. We were fortunate in having located in Tiflis a Government vaccine institute, in charge of a graduate of the Pasteur Institute, Paris. This institution prepared for us all the combined vaccine, smallpox vaccine, and diphtheria antitoxin used by us. Their products proved very satisfactory and our relations with them were entirely cordial.

In addition to the medical relief work in Armenia, we conducted other operations along medical relief lines. In the Republic of Georgia we maintain, in Tiflis, two public ambulatories where medical treatment and drugs are furnished gratuitously to the worthy poor. In addition to medical treatment, a milk station for nursing mothers is also maintained where one hundred nursing mothers and infants receive milk

daily. At various times we supplied the local hospitals, which were about to suspend operations, as a result of a shortage of surgical gauze, rubber gloves, sutures and dressing material.

In the Republic of Azerbaijan we maintained, in Baku, the capital, a public ambulatory, where free medical attention and drugs were furnished deserving individuals.

One moderate-sized shipment of surgical dressings, ether, chloroform, drugs, sutures, and rubber gloves was furnished the Azerbaijan Government for the local surgical hospital, Baku, so this institution could be kept functioning. One 50 lb. shipment of quinine and two carloads of surgical dressings were furnished the District Commander, Baku, for distribution where most needed. Most of the quinine shipment was used in the malarial belt on the Mougan steppe at the mouth of Araxes. Separate shipments of essential drugs and dressings, accompanied by a doctor in each instance to prescribe and dispense them, were sent to the following communities: Elizabetinka, Elizabetopol. and Akstafa. When the Red Cross shipment arrived an entire trainload of medical supplies and dressings was sent to Baku. This arrived just before Baku was taken by the Bolsheviks, and from reports received from a reliable source, this train, in its entirety, was immediately dispatched to Moscow, where in all probability the contents were put to very good use. The official diplomatic representative of the Daghestan Government was furnished a liberal supply of essential drugs and dressings for the treatment of the mountaineers who were wounded fighting for the independence of this struggling republic.

SANITATION AND PREVENTIVE MEASURES

SANITARY INSPECTIONS

The District Physician, in the various districts, was charged officially with the sanitation of the district in so far as this matter related to Near East Relief activities. As a matter of fact the only sanitary work done, outside our own institutions in the various districts was accomplished by our organization. Through the labor obtainable in our refugee camps a great deal of work of permanent benefit was accomplished, such as the rebuilding of public works and buildings, the building and repair of roads, drainage and general police work. All of this work contributed to a generally better standard of sanitation. Owing to the great number of refugees present in the larger centers, as Erivan, Alexandropol, and Kars, and the lack of adequate housing facilities, there existed great overcrowding and congestion with a resultant difficulty in maintaining a decent standard of cleanliness and police. With the adoption, though of the present repatriation plan, which contemplates the location of

these refugees in small villages, near the present Armenian frontier, this difficulty will be obviated.

There is no modern water supply system in any of the larger centers of Armenia. The source of the supply in practically all communities is from the mountain streams. This supply, while not above reproach, has been demonstrated to be potable, and when handled with any degree of care has not thus far produced any of the water-borne diseases.

All the institutions maintained by the Near East Relief, including orphanages, hospitals, and refugee camps, not possessing water-borne systems of sewage or septic tanks, have been equipped with pit latrines or the native concreted latrine which may be flushed with water. These latter, of simple construction, have proved to be very satisfactory.

All our institutions have provided also baths, laundries, and adequate delousing and disinfecting facilities. While a great deal of this apparatus was of rather crude construction, the results obtained were very satisfactory. We were fortunate in falling heir to a considerable number of delousers the Russian Army had left in their hurried exodus from the Caucasus in 1917. These delousers consisted of nothing more than a large galvanized box mounted on wheels, with a revolving wire cage in which clothes were placed. A fire box was provided below. A temperature of 145°F., maintained for 15 minutes, sufficed to kill adults and eggs. This simple type of delouser proved satisfactory. Owing to a scarcity of fuel during the winter, it has not always been possible to provide an adequate supply of hot water for bath and laundry purposes and this has always been reflected, particularly in the orphanages, in an increased incidence of scabies and lousiness.

PROPHYLACTIC MEDICINE

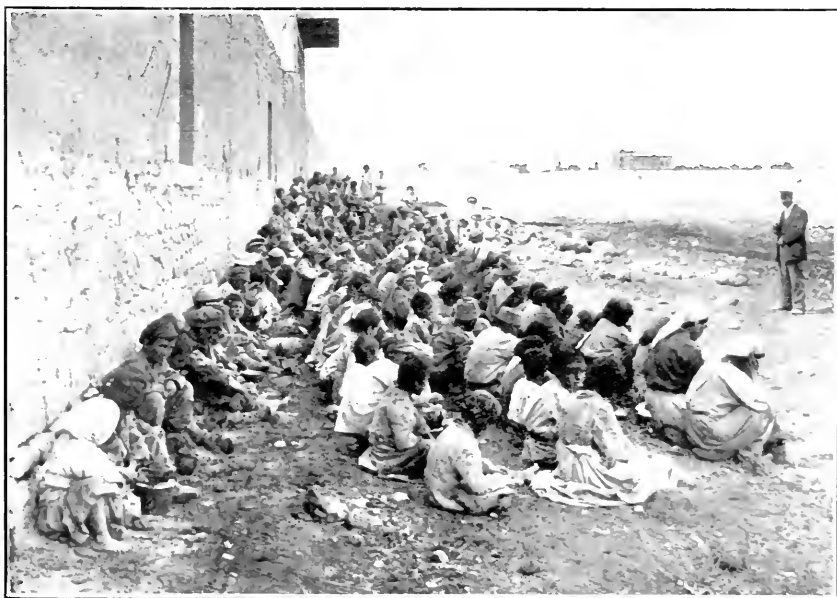
THE INOCULATION PLAN

When the American Committee for Relief in the Near East and the American Relief Administration were incorporated into the Near East Relief, it was appreciated that in addition to the food relief measures to be instituted in the various districts, a systematized method of medical relief would have to be introduced and administered along similar lines. At that time, September 10, 1919, there existed throughout Armenia no well-defined system of medical relief. In the three districts that were then in operation, Erivan, Alexandropol and Kars, Medical relief work, as a result of the limited personnel and supplies, was being done principally among the orphans, and to a lesser degree through public dispensaries for the refugees and needy poor.

It was appreciated at this time that to avoid a recurrence of any of the epidemics prevalent over Russian and Turkish Armenia from 1914

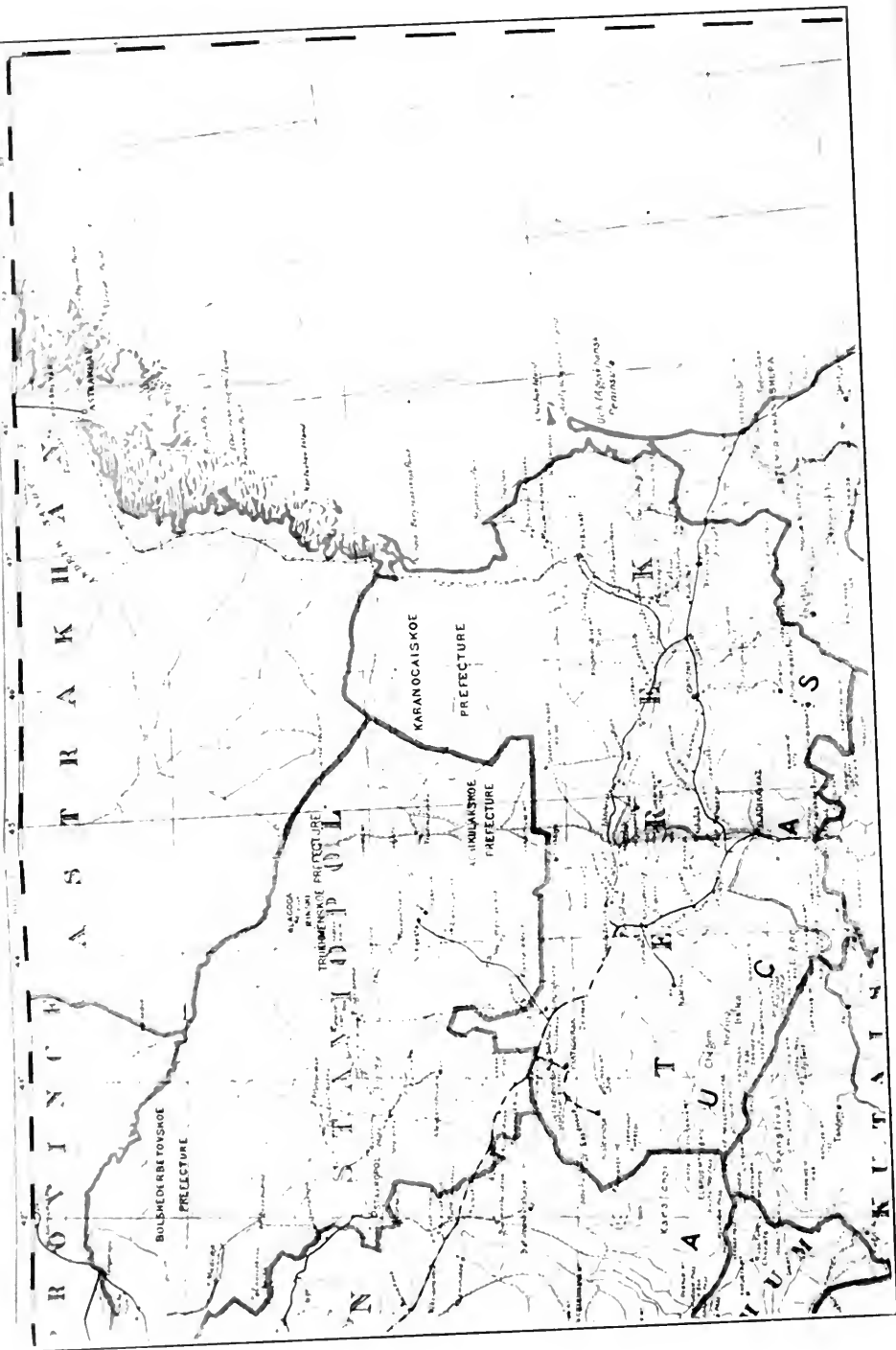


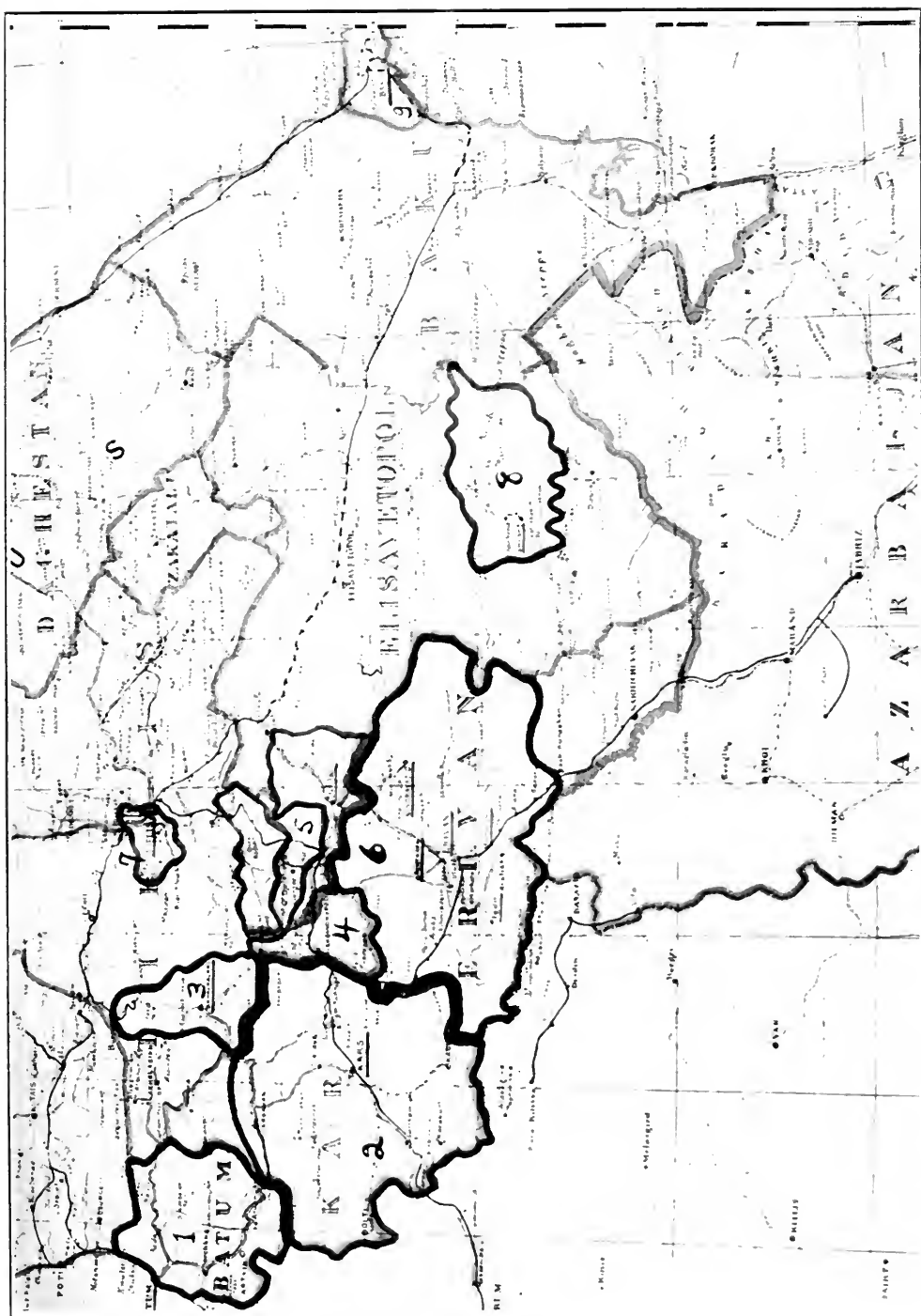
Alexandryopol—Showing a part of Kasachipost which housed 5,000 orphans. Mt. Alagöz beyond.



Refugee children awaiting the opening of the soup kitchen Etchmiadzin, outside of Erivan
(To face page 150.)

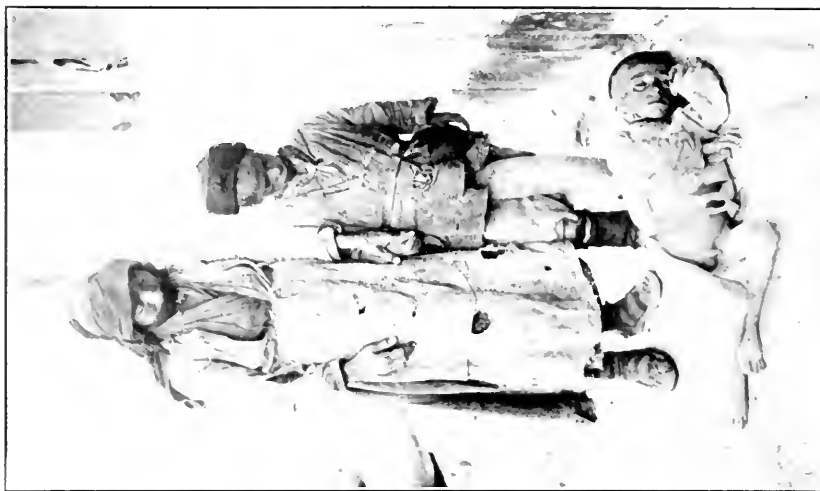
CAUCASIA







Showing the always prevalent congestion in one of our scabies hospitals, Erivan.



The sidewalk his death bed

to 1919, it would be necessary to enlarge and expand work along three lines: (1) Food relief, to put the general population in a better state of nutrition which would enable them to build up their powers of resistance; (2) to expand and enlarge the existing hospital facilities to isolate and adequately care for all communicable diseases; (3) to institute prophylactic measures looking towards the prevention of disease.

The inoculation plan has to do with only the latter phase of the projected program, the prevention of disease. Among the diseases which caused a heavy mortality in the preceding five years were those of the intestinal group, particularly typhoid, paratyphoid, cholera and dysentery, and also, though not so serious a factor in the death rate, smallpox. That these diseases were extremely liable to prevail as a result of the undernourishment, uncleanness, congestion, and the generally poor physical condition of the population which existed at that time, there was no reason to doubt. At Erivan and Alexandropol alone, in August and September, 1919, eighty to one hundred refugees were dying daily, chiefly from diseases of the intestinal group, though owing to the inadequacy of the laboratory equipment and personnel it was not always possible to make accurate diagnosis.

As a rapid, effective, practicable measure against the first diseases named, *i.e.*, typhoid, paratyphoid "A", paratyphoid "B", and cholera, a combined vaccine containing the following per c.c. was prepared:

Typhoid.....	500,000,000
Paratyphoid "A".....	250,000,000
Paratyphoid "B".....	250,000,000
Cholera.....	1,000,000,000

Two one cubic centimeter doses at seven-day intervals constituted the treatment for adults. At the same time the individual received his initial dose of the combined vaccine, he was vaccinated against smallpox.

General Order 13, Headquarters, Near East Relief, Caucasus Branch, was published and circulated in all the districts. Among other things, it prescribed that under the supervision of the District Physician in each district, "tetra" vaccine and smallpox vaccination would be administered to all persons to whom we were affording food relief. A medical bulletin for the information of the medical personnel was prepared and issued at the same time. This prescribed the technic of administration and gave other pertinent information. Newspaper articles in simple non-technical language were prepared and published in the native newspapers throughout the various districts. An endeavor was made to secure as much publicity as possible through the native physicians and nurses who through personal instruction by the various District Physicians were made conversant with what we were trying to

accomplish. In some of the districts where the District Commanders were coöperating, a measure that greatly facilitated the administration of the vaccine among the refugees was our absolute control of the food supply through bread distribution stations. Every refugee had to report in person with a properly certified ticket before he could procure his daily allowance of bread. It was thus an easy matter among this group to reach all members of the family. While it might seem that some of the measures taken to vaccinate bordered on compulsion, such was not the case. It was rather remarkable how the population volunteered, both adults and children. Some unusually audacious person would request vaccination. The onlookers would ask him whether or not it was painful, and when he stated no, as he generally did, the whole group would consent. With some individuals where permission, tact, and diplomacy were of no avail, moral suasion and cutting off his bread supply usually sufficed to bring him around to our point of view. All in all, the people receiving relief were willing to coöperate and very little pressure had to be brought to bear in this manner.

RESULTS ACCOMPLISHED

This plan was introduced in some of the districts in the latter part of November, 1919. Practically all districts had been supplied with vaccine on December 1, 1919. When the Haskell Mission left the Caucasus in the latter part of July, 1920, 190,000 men, women, and children had completed both smallpox and tetra vaccination.

While it is recognized that the better nourishment of the population generally, the better standard of sanitation adopted and maintained, and the relieving of some of the congestion in the larger centers all played a rôle in the reduced incidence of these diseases, yet it is impossible to accord all the credit to these measures alone. The best criterion of what the inoculation plan accomplished is the present incidence of the diseases. The June morbidity reports of all hospitals functioning under the Near East Relief show the following number of cases of typhoid, paratyphoid, cholera, and smallpox remaining in hospital at the end of the month: Typhoid 9, paratyphoid 1, cholera 0, smallpox 3. One case of typhoid had received a dose of the vaccine 5 weeks previously. While we had sporadic cases of typhoid, paratyphoid, and smallpox in our hospitals since the inauguration of this campaign, among unvaccinated individuals, we have as yet had no admissions to hospital for any of the above diseases among individuals who had completed the whole course of inoculation.

LABORATORY WORK IN EFFICIENCY OF VACCINE

Further proof of the efficacy and immunizing power of this vaccine has been afforded by work in our general bacteriological laboratory,

Tiflis, by demonstrating the high agglutinating powers of this vaccine. This will form the basis of a special technical report.

MEDICAL BULLETINS

Medical bulletins printed in both English and Russian have been published at appropriate times, to put into execution measures thought to have been warranted in furthering certain phases of medical relief work. These varied from a bulletin on diet with a table of caloric values and notes on a standardized ration, of 20 pages, to an elementary hygiene for use in the public schools of Armenia, of 100 pages.

PREVAILING DISEASES

COMMUNICABLE DISEASES: TYPHOID, PARATYPHOID AND CHOLERA

Typhoid, paratyphoid, cholera and dysentery have been shown to have caused a very heavy mortality in both Russian and Turkish Armenia during the years 1914, 1915, 1917, and 1918. With the exception of the last named, it is believed that adequate measures have been taken against their appearance in epidemic form. It is further believed that the maintenance of our present standard of sanitation, the continued assurance of a potable water supply, continued measures against overcrowding, the maintenance of our present system of food relief, and a further extension of our vaccination program among the general population, will eliminate these three diseases or limit them to an occasional case.

DYSENTERY AND ENTERITIS

Dysentery and enteritis are much more difficult diseases to control. Dysentery, with enteritis particularly, among children, has already caused a considerable mortality among the population, and at this time is, as shown by our monthly morbidity reports, the leading factor in the death rate of both adults and children in all the institutions maintained by us. It is believed, though, with the continuance of our present preventive measures, as outlined above, and the better state of nutrition in the population generally as observed from month to month, that the mortality rate from dysentery and enteritis will continue to decrease.

*Total Deaths in all Districts from Dysentery and Enteritis. Dec. 1, 1919,
to August 1, 1920.*

December.....	147	April.....	84
January.....	146	May.....	70
February.....	75	June.....	63
March.....	66	July.....	78

TYPHUS

Our experience with typhus has been rather unusual. It was felt that it would be impossible, as a result of the inadequacy in housing facilities and the resultant overcrowding, for any of the districts to get through the winter without an epidemic. Accordingly, as far as we were able, bathing, delousing, disinfecting and hospital facilities were organized in each district in anticipation of the expected outbreak. In none of the districts did the expected epidemic materialize, and outside of occasional sporadic cases we have been singularly free from the disease.

In the Alexandropol district where 25,000 men, women and children were housed, fed, clothed and provided bathing and delousing facilities is what is known as the "Polygon"; *i.e.*, old Russian Military Barracks, adjacent to Alexandropol. Hospital facilities were provided in the Compound also. Until the appearance of influenza, this community got through the winter with a monthly mortality rate, during the coldest months of the year, of less than .02 per cent. Including the deaths from influenza, the rate is .040 per cent, which should be considered rather remarkable. Equally good results were obtained in both the Kars and Karaklis districts with the institution of similar measures.

It is believed that at the present time we have adequate facilities in all the districts to successfully combat this disease should it again appear in epidemic form.

Total Cases of Typhus Reported in all Districts from October 1, 1919 to August 1, 1920.

October.....	24	March.....	51
November.....	53	April.....	45
December.....	64	May.....	62
January.....	34	June.....	68
February 29.....	29	July.....	71

INFLUENZA

The only epidemic that has confronted the Near East Relief thus far is a recrudescence of the influenza epidemic of 1918. During the latter part of December, 1919, influenza put in its appearance at Erivan, appearing during the course of the following week in all the districts. Owing to the fact that timely measures had been undertaken to relieve undernourishment, prevent congestion, and to segregate the cases, the incidence of the disease was very much reduced. The peak of the epidemic was reached about the middle of January. After February 15 very few cases were reported. A total number of 15,695 cases were treated by Near East Relief institutions and personnel, with 110 deaths.

The mortality in the hospitalized cases treated by the Near East Relief is comparatively high for the reason that we possess the only ade-

quate facilities for treatment of the serious cases, particularly pneumonia, the milder cases being treated by Near East Relief personnel outside the hospitals. The primary cause of a great many admissions to hospitals was pneumonia.

MALARIA

Malaria, in its season, the summer and fall, presents the same difficulties that typhus did. We anticipated heavy incidence of this disease, particularly in that part of the population living in the vicinity of the Araxes River and its tributaries. Russian pre-war statistics show that in the Erivan District alone, during the worst part of the season, from May to October, 7,000 people are constantly sick with this disease.

Our experience in our own institutions demonstrated that relapses are a common cause of admission to our hospitals, and took in their treatment all our available supply of quinine. With our supply of quinine considerably augmented we anticipated instituting active anti-malarial measures in those districts adjacent to the Araxes River and its tributaries. Outside of quinine prophylaxis measures could not be carried out owing to political conditions prevailing in this portion of Armenia adjacent to the old Turkish frontier at this time.

TUBERCULOSIS

The undernutrition, particularly of the refugee, industrial, and minor commercial classes, is mainly responsible for the fact that tuberculosis has increased. This will be easily realized when one considers the lack of available fat and animal protein. The lack of meat makes it almost impossible for these classes to obtain animal protein in this way. The lack of a sufficient milk supply is another important factor in this nutritional problem, particularly among the children. It may be said, therefore, that the increase in tuberculosis is due to lowered vitality as a result of undernourishment, and further, that the present unaffected individuals, with a continuance of the present relief work, within two or three months will probably return to their former condition of health.

FAVUS AND SCABIES

We now maintain communicable skin disease hospitals, with a capacity of 2,500 beds, practically all of which are filled with favus and scabies and impetigo cases. With these hospitals and our present system of receiving hospitals where children are bathed, deloused, and issued clean clothing before being admitted to our orphanages, the incidence of scabies is decreasing and the disease is under control. We have been

somewhat handicapped in the treatment of these cases, though, by an insufficient supply of linen and clean clothing.

Practically 80 per cent of the inmates of our Skin Disease Hospitals are suffering from favus. These hospitals will continue to operate for some time to come. Favus is a much more intractable disease, as regards treatment, than scabies. We have been handicapped here in the treatment of these cases by a lack of Roentgen Ray apparatus.

FROST BITE

Due to inadequate foot covering for some of our orphans, the lack of an adequate fuel supply for some of our institutions, and the intense cold in parts of Armenia during the winter, about 300 of the orphans developed frost-bite, sometimes leading to gangrene which, of course, demanded amputation. With the onset of warmer weather we were no longer confronted with this problem.

DEFICIENCY DISEASES

Of the deficiency diseases, as Scurvy, Beri-beri, Pelagra, Rickets, Acidosis, Night Blindness, and Malnutrition Nephritis, which are caused by subsistence on a diet lacking "vitamins," we have had only to contend with the first and the last two named: Scurvy, Night blindness and Malnutrition Nephritis.

SCURVY

Until recently a great many cases of so-called stomatitis among the children were reported from all the districts. These cases, as seen clinically, varied from a mild catarrhal stomatitis with swollen, bleeding, spongy gums, with few constitutional symptoms, to a severe type characterized by a rapidly spreading gangrenous affection of the cheeks and gums, and ended fatally in most cases. After some study and observation of these cases, it was determined that they were cases of infantile scurvy. Accordingly, in addition to the local treatment to the mouth, dietetic measures were prescribed to insure the feeding of a plentiful supply of fresh fruits and vegetables. A small supply of lime juice on hand was distributed and steps were taken to increase the quantity of milk and fresh meat in the hospital diets. These changes were effected with happy results and as a consequence the number of cases is constantly decreasing. Very few cases of adult scurvy have been seen or reported. No cases are reported on the current monthly reports from any of our hospitals. It is believed that the balancing of the diet, particularly in our institutions, has now been placed on a sound basis as a result of the use of the information contained

in our medical bulletin No. 2—"A Table of Caloric Values and Analysis of the Common Foods, with Notes on a Standardized Ration."

NIGHT BLINDNESS

A considerable number of cases of night blindness have been reported, particularly from the Tiflis District, among the orphanage children. This condition is entirely a functional complaint, consisting in a diminished sensibility of the retina, and manifesting itself by an abnormal shrinking of the visual field for white and colors in increasing twilight. This condition has generally been found associated with malnutrition, particularly among debilitated and scorbutic children. It is more prevalent in Russia than elsewhere. In our own institutions it has no doubt been due to deficiency of fat and albumen in the diet. This condition no longer exists, and very few cases have been reported recently as a result of the increase of the fat and albumen components of the diet. Cod liver oil, in our experience, has proven a very valuable adjunct in the treatment of these cases.

MALNUTRITION NEPHRITIS

A great many cases of nephritis and edema resulting from malnutrition were reported earlier in our work. Due to the much better state of nutrition now existing in the population generally, the incidence of these cases has steadily declined, and it is believed that with a continuance of measures of food relief these conditions will be entirely eliminated.

CONCLUSIONS

Speaking generally, it may be said that the present health situation in Armenia is not so gloomy as might be expected under the circumstances. While there is yet great privation, particularly among the refugees and native poor, the work of the Near East Relief, Caucasus Branch, has been such that the adult population, while undernourished, is in a position, at the present moment, to quickly recover its normal condition. The general solicitude for children has resulted in such improvement that this class as a whole, while not quite satisfactory, may be considered almost normal. All that is needed in this regard is the efficient continuance of this work. This will be realized as a result of the contribution of the Commonwealth Child Fund of \$750,000. This fund should insure every Armenian child being placed in a normal state of nutrition and health where food and medical relief measures can accomplish this end. The rigorous watchfulness of all personnel charged with matters pertaining to health has prevented any undue amount of epidemic disease since the present organization assumed charge. The

whole organization since its inception has been insistent on the question of nutrition and health.

It is believed that as a result of the food relief measures inaugurated and maintained by the Near East Relief, Caucasus Branch, from September 10, 1919, to August 1, 1920, 500,000 Armenian men, women, and children are now alive who would have perished from starvation but for the food relief furnished through our organization. Practically the whole Armenian Nation was dependent on our organization for hospitalization and medical relief. It is impossible to state how many lives were saved as a result of the medical relief measures instituted.

On August 1, 1920, owing to the fact that our food-relief program and the concentration of our orphanage, child-feeding and medical-relief activities had been completed, the Haskell Mission left the Caucasus. As a result of the political situation existing at that time and the fact that our food-relief program among adults had been completed as a measure of economy to facilitate, supply and to further reduce our personnel, it was deemed advisable to concentrate all our relief activities in the three large centers of Alexandropol, Kars and Erivan, which provided good housing and railroad facilities. At that time Armenia was harvesting a very fair crop, the best in five years. The Armenian Minister of Supply stated that this crop would carry them through eight months of the year. The responsible Armenian officials are now negotiating for American credit to purchase needed foodstuffs to carry them through the rest of the year.



SOME MISLEADING BELIEFS REGARDING PULMONARY TUBERCULOSIS

By EDWARD O. OTIS, M.D.

Medical Reserve Corps, Boston

I. Persistent rales as an evidence of active or unhealed pulmonary tuberculosis:

In the examination of the National Army for tuberculosis, before going overseas, the detection of persistent rales at or near the apex of the lungs was considered one of, if not *the* physical sign which called for rejection, although the soldier might have been in good physical condition otherwise, and with no evidence of general infection. Considering the rapidity with which these examinations had to be made, and with no time for any adequate history, this was probably the safest plan to follow. In civil life, however, with time for an exhaustive examination, the presence of persistent rales *alone* does not warrant one in making a diagnosis of active or unhealed tuberculosis and does not call for special treatment unless there is other evidence of active disease.

If, with the presence of rales at one or both apices, there is other evidence that tuberculous toxæmia is present such as increased afternoon temperature, a rapid pulse, cough with expectoration and loss of weight and strength, then surely active disease is present and would be if no rales were discoverable. If, however, none of these symptoms exist and the individual is in good physical condition and can undergo physical exertion without rise of temperature or any symptoms of auto-intoxication, then the rales indicate only what has been and not what at the present time exists. It is not an unusual occurrence to observe a patient who has for many months lost all his symptoms, presenting every evidence of perfect health and able without detriment to pursue his usual duties, still showing rales over the area of the localized disease, and these rales may persist for months or even years.

Whatever the exact pathological condition may be, it is purely local and is unaccompanied by any general disturbance. The patient, therefore, requires no treatment and should not be considered as actively tuberculous.

As an illustration: Some eight years ago I saw a young man, twenty years of age, with advanced active tuberculosis. He had abundant rales, large and small, almost throughout the right chest; had a history of a previous hemoptysis; a temperature of 99.6 F. in the forenoon, a pulse of 92, with cough and expectoration. The general condition seemed so bad that an unfavorable prognosis was given at the time.

The unexpected fortunately happened, however, and he progressively improved. Five years later he appeared one day in my office in the uniform of a naval apprentice, having successfully passed the medical examination for entrance into the navy. On examination he seemed in perfect health but the rales in the right chest were still there. He went through his service to the end of the war and came out in as good condition as when he entered the navy. If one had examined this man for the first time and depended upon the presence of rales alone for his diagnosis he would have been rejected and sent to a sanatorium. He was, however, in the state of a complete and permanent arrest of his disease, as was subsequently shown, and whatever the significance of the rales was they surely did not indicate any active disease. This is only one of other similar cases which might be cited.

As Paterson remarks: "Crepitations (rales) may remain for many years where a lesion has healed, and do not mean active tuberculosis."¹

The physical signs of a case of pulmonary tuberculosis, the most important of which are rales, are only the local manifestations of a general disease, and these local signs may remain when the general disease has been overcome and a permanent resistance to the bacilli and their products has been established. It is true that in the greater number of cases when rales are present at one or the other apex there are co-existing symptoms of a general infection, and the rales are the local evidence of the constitutional disturbance. It is the toxæmic symptoms that are the indication of the active disease, not the rales. When, therefore, all evidence of tuberculous toxæmia has disappeared, but the rales remain, they then indicate only what has happened, and one should bear this in mind in forming an opinion upon the progress of a case under treatment. Of course one may say that as long as rales remain, the disease is only quiescent and toxæmic symptoms may appear at any time when the patient is under stress. This, indeed, may happen, but on the other hand it may not, and the test is the continued physical activity of the patient, and when this takes place without detriment, the disease may be considered as permanently arrested.

In the past I am sure that I have been unduly apprehensive of patients with persistent rales, and have retained them under treatment for this reason alone, when in other respects they have shown no constitutional evidence of activity. To put the case aphoristically, rales alone do not prove *active* tuberculosis, and rales may remain an indefinite time after the lesion has healed.

II. Tubercle Bacilli in the Sputum.

When tubercle bacilli have been demonstrated in the sputum it

¹"The Shibboleths of Tuberculosis," Marcus Paterson, N. Y., 1920, E. P. Dutton & Co.

has been generally considered that the carrier is actively tuberculous and should be placed under active treatment. Undoubtedly this is the right course to pursue in the majority of cases, for generally there are other symptoms of activity; otherwise the individual would not be aware of any illness and consult his physician. It has been found, however, that certain healthy persons, when from one cause or another they have had their sputum examined, have shown tubercle bacilli.

Paterson² narrates the case of a young house physician in his usual health but having a little sputum, who out of curiosity stained and examined it, and to his surprise found it positive. Alarmed at his discovery he entered a sanatorium, not for any disturbance in his health but because of the tubercle bacilli. After his sanatorium course he was discharged "arrested but with tubercle bacilli still present." He has remained in perfect health for the last twelve years but still finds tubercle bacilli whenever he has any sputum.

Fowler, quoted by Paterson, also mentioned the case of a man who showed tubercle bacilli in his sputum on every occasion when an examination was made for fourteen years, and during that period had been actively at work and enjoyed good health. Since this paper was completed the writer has just met with a patient in his clinic who had tubercle bacilli in his sputum, and yet was perfectly well so far as any symptoms or physical signs were concerned. He was referred by his physician who discovered the tubercle bacilli, evidently with the belief that because the tubercle bacilli were present he should be placed under treatment. The patient was advised to go about his usual occupation, and his physician advised merely to keep him under observation. On the other hand, we may have abundant evidence of active tuberculosis without being able to detect tubercle bacilli in the sputum on repeated examinations. In both cases it is the symptoms of tuberculous toxæmia which differentiate the one case from the other.

Why should we not have tubercle bacilli carriers as we do carriers of other infectious diseases, such as the carriers of typhoid and diphtheria bacilli? It is quite probable that if the sputum of a number of healthy persons was examined, certain of them would show a positive sputum. They might be a menace to others as typhoid bacilli carriers are but they are not a menace to themselves for they are well and not ill. If, therefore, tubercle bacilli should happen to be found in a person of good health he should not take the event too seriously as meaning the advent of active tuberculosis; nor does he need treatment for that fact alone. He should, however, beware of infecting others, or at least children, if

² *Loc. cit.*

he holds with Bushnell that one adult with tubercle bacilli cannot infect another adult but may infect children.

Tubercle bacilli in the sputum, with no other symptoms does not mean active tuberculosis, and one may have them for years without disease.

III. The Early Diagnosis.

There is still, I believe, too much dependence placed upon the detection of definite physical signs, the finding of tubercle bacilli in the sputum, and the result of the X-ray examination in making an early diagnosis, or a so-called early diagnosis of pulmonary tuberculosis. If no definite physical signs can be discovered and the sputum examination is negative, one hesitates about making a positive or even a probable diagnosis of tuberculosis although there may be the leading characteristic symptoms of tuberculous toxæmia, such as an afternoon rise of temperature, rapid pulse, loss of weight and strength and a persistent cough—all symptoms which indicate an active tuberculous infection. With the most painstaking physical examination, one may be, and often is, unable to detect a small tuberculous focus embedded in the lung substance, for it may be so completely surrounded by normal lung tissue that only normal sounds may be elicited upon percussion and auscultation, and unless the focus is connected with a bronchus there will be no tubercle bacilli in the sputum. If, however, the characteristic symptoms, as enumerated above, are present, it is unmistakable evidence that active tuberculous infection exists and consequently immediate treatment is demanded. It requires some courage, perhaps, to make a diagnosis upon symptoms alone, and one is tempted to wait for physical signs. If one, however, assumes this attitude the most favorable time for successful treatment may be lost.

With regard to the X-ray in early diagnosis, it is to be remembered that almost any healthy person shows some markings in the X-ray plate, which may be interpreted as a tuberculous infiltration. Many times in my dispensary work I have had an X-ray plate interpreted by the expert examiner as showing some tuberculous infiltration when I have been unable to detect any physical signs or elicit symptoms which indicated any active disease. No one should depend absolutely upon the X-ray for a diagnosis of early tuberculosis. The plate may show some evidence of an old time, long healed focus, but this does not indicate active disease. The most one ought to expect from the X-ray picture is additional evidence one way or the other when in doubt as to the diagnosis, or as more accurately showing the extent of the disease found as already existing.

An early diagnosis must, as a rule, be made upon the symptoms of tuberculous toxæmia. Physical signs may or may not be present.

IV. The Dangers of Infection.

There still exists, even among the profession, an unjustifiable fear of the communicability of pulmonary tuberculosis from one adult to another adult, even when the association is not intimate. That no general hospital will receive tuberculous patients testifies to this fear. If, however, we accept the belief now held by many authorities, notably by Bushnell in this country, that tuberculous infection generally, if not always, occurs in childhood, and that when active disease occurs in adult life it is the activation of the childhood infection and not a new exogenous one, then the obvious conclusion is that this dread of adult infection is unwarranted and has caused and is causing a great deal of unnecessary suffering for which the physician must bear his share of the blame. The fault, however, was one of ignorance, not of fear.

Whereas I do not believe that it has been fully demonstrated, in the present state of our knowledge, that adult to adult infection cannot take place, particularly if the dose is massive, still the evidence from the von Pirquet test, from autopsies upon persons dying from other diseases and from the X-ray seems to indicate that the majority of children in civilized communities receive a tuberculous infection (not tuberculous disease) before they arrive at adult age, and it is a fair assumption, at least, that it is this childhood infection which causes the disease in later life when it does occur, and not a new exogenous infection recently acquired.

Take the case of husband and wife, when one or the other is suffering from active tuberculosis. Although the evidence is conflicting, still there is much evidence from the investigation of recognized authorities that there is no more tuberculosis developed in the well mate of the husband or wife who is tuberculous than in the general population.

Again, in consumptive hospitals and sanatoria, the general experience is that there is no more tuberculosis developed among the physicians and attendants than in the public at large.

"Out of 240 nurses employed at the Cincinnati Tuberculosis Sanitarium," says J. B. Rogers,³ "only three developed tuberculosis, and one diagnosed as tuberculosis, after working at the sanatorium for two years, gave a history of previous infection." And in conclusion Dr. Rogers declares that "aside from the mere presence of the organisms in the body, other factors are necessary for the development of clinical tuberculosis."

³*Journal of the American Medical Association*, Dec. 18, 1920.

Another evil of this undue fear of the ready communicability of tuberculosis is that the consumptive is tempted to conceal his disease and in consequence to neglect the ordinary precautions in the disposal of his sputum. In the present uncertain state of our knowledge it is on the side of safety to still continue all reasonable precautions against a possible exogenous infection from one adult to another, but at the same time to bear in mind that there is much evidence and much authority for believing that this rarely, occurs, and in consequence of this conception to discourage undue fear in associating with the tuberculous. With young children the case is obviously different, and every precaution should be taken to prevent their infection.

Undue fear of the communicability of pulmonary tuberculosis from one adult to another is unwarranted in the present state of our knowledge and there is much evidence for the belief that it never occurs.

V. The "Open Air" Treatment and Climate.

The treatment of pulmonary tuberculosis has been and is still by many looked upon as consisting principally of abundant or excessive nourishment, constant exposure to outdoor air, preferably in a so-called favorable climate, and rest. The impression is still wide spread that the "open air" and climatic elements in the treatment are the most essential parts of it. No matter what the reaction of the patient is to the constant outdoor exposure, what the stage of the disease is, or what the season or temperature may be, he must lead this constant outdoor life, and furthermore, if possible, he must seek one of the favorable climates in which to do it. It used to be a familiar occurrence, happily not so frequent now, for a patient—in whatever stage of the disease he was in—sometimes, with the advice of his physician, and more times without it, to go far afield to the distant west or southwest, believing that, if he once reached the delectable favorable climate, all he had to do was to camp out there and get well, living according to his own devices. The excellent results obtained in our well conducted sanatoria, wherever situated, have taught us that successful treatment depends upon the *tout ensemble* of the management of the tuberculous individual, and upon no one element in the treatment to the disregard of the others.

It is not this or that climate, or a mere exposure to outdoor air, but all the other and quite as essential factors in the systematic management of a case of active tuberculosis which lead to a favorable issue. Moreover, as in other diseases, the patient must be individualized. For example: Some persons suffer bitterly from the cold, and for such, a well ventilated room during the colder weather, for at least a part of the day, when their feeble vitality could be conserved and existence

made more endurable, would, in my opinion, produce quite as good results as the day long exposure to the frigid atmosphere of the winter. Air is air, and it is possible to have reasonably pure air indoor and warm enough to make one comfortable. I do not believe that it is the wisest procedure to subject all patients without discrimination to the complete outdoor life. Experience has taught us that our former plan of over-feeding the tuberculous individual has not produced such good results as a more moderate diet and that when he can eat three good meals a day he is better without the intermediate lunches or eggs and milk galore. So it seems to me we should regulate the outdoor life according to the individual condition and not rigidly expose all alike.

As to change of climate, undoubtedly one can take the "cure" more comfortably in some of the so-called "more favorable climates" where there is more sunshine than in the northern latitudes, but the results obtained in the latter under competent and skilled direction appear to be equally favorable with those obtained in the climatic resorts.

The essential thing for successful treatment is a carefully planned and rigidly adhered to course of life and not any specific climate or fixed system of outdoor exposure applied to all without discrimination.

"Open air treatment," says Paterson,⁴ "is still by many considered all that is necessary. There could be no greater misconception. Pure air is better than impure air to all, whether tuberculous or not, but it will not by itself raise the resistance of the patient to his own toxins, which is the crucial matter to him."

Diet, pure air, rest and exercise are the four fundamental factors in the treatment of tuberculosis, and their application seems easy, but every experienced phthisiotherapist knows that to skillfully employ these means requires great judgment, much experience and a wise individualization of the patient. There is requisite, both on the part of the physician as well as on the part of the patient, the same ingredient with which Opie mixed his paints—"brains."

The open air treatment must be applied with judgment, and climate alone will not cure a tuberculous individual. Tuberculosis can be cured in any climate.

VI. Exercise during the "Cure."

There are at the present time two schools or two beliefs regarding exercise in the course of the treatment of pulmonary tuberculosis. The one which may be called the Dettweiler school or belief, first advocated by this German phthisiotherapist and practiced at his sanatorium at Falkenstein, emphasized rest continued practically

throughout the entire treatment. Dettweiler denominated it the "*Ruheluft-Kur*."

The other school, whose chief exponent is Paterson, formerly of the Frimley Sanatorium in England, believed in graduated exercise begun as soon as the patient is free from fever and active symptoms, the exercise being graduated to the condition and progress of the individual. Paterson's belief and practice is founded upon the theory or fact of "auto-inoculation," "the use of the patient's own bacterial products to attempt the arrest of the disease."

Paterson's method, in brief, is to gradually accustom the patient to exercise or work under careful medical supervision, and advancing from light to more and more severe and extended exercise or work, at first simply short walks and later manual labor until finally a fairly good day's work can be accomplished. Very careful watch is kept over the exercising patient, and if, at any time, he shows too much auto-inoculation going into auto-intoxication, he is laid off and put at rest until all symptoms have subsided. The patients who qualify for the auto-inoculation treatment are carefully selected.

Paterson's results and those of others who have followed his plan, such as King, of the Loomis Sanitarium, are apparently very satisfactory and there is the added advantage that, if this method is successful, the patient, at the end of his sanatorium treatment, is already prepared to return to his work, or any work. . . In other words, he has tried himself out at the sanatorium during his treatment, and knows what he can do and endure on his release from treatment. It would seem to be a reasonable, and, under medical supervision, a safe procedure somewhat analogous to the manner of estimating the capacity of the heart for work by the "effort syndrome."

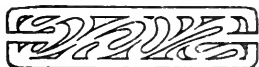
If Paterson's theory of auto-inoculation is true, his method of accomplishing this should hasten recovery by increasing the antibodies, by autogenous vaccine, one may call it. The "rest cure," as practiced by its most ardent advocates, would seem to be extreme, and I suspect that the former haphazard manner of taking exercise with no supervision, with the resultant frequent disasters, may have had something to do with this other extreme. The middle course between these two schools would appear to be the safest course with the majority of cases. "*Medio tutissimus ibis*."

The consumptive en route to an arrest needs much rest, even when the toxæmia has abated, but there seems to be no more reason why carefully and medically supervised exercise should not be begun at the proper time and with selected patients, than that tuberculin should not be employed at the proper time with selected patients (if one be-

lieves in tuberculin), for each are supposed to accomplish the same thing—an increase of resistance.

One reason why graduated exercise is not employed more frequently than it is, is, I suspect, because it requires more skilled supervision and greater effort on the part of the physician than does keeping the patient at rest. Ordinary sanatorium procedure is more accustomed to the rest treatment than to the graduated exercise method. Furthermore, when exercise is prescribed it is all too frequently done in an indefinite way without the supervision which alone can make it safe and produce results.

In the treatment of pulmonary tuberculosis there is a time for exercise as well as rest, but one must wisely choose the time for the former and skillfully direct it.



KEEPING FIT IN THE TROPICS

BY CAPTAIN ELBRIDGE COLBY,

Infantry, O. R. C., U. S. Army, formerly Morale Officer at Camp at Gatun, C. Z.

TWO statements are so frequently made nowadays that we have come to consider them almost axiomatic. The first is that tropical weather has an enervating effect upon settlers who come from temperate climates. The second is that army life with its outdoor exercise is splendid for health. But what about army life in the tropics? Does the monotony of continuous hot weather make soldiers lose their "pep" and does it "thin" their blood in the same degree or in the same manner (though in lesser degree) as in the case of civilians? Probably we shall never be able to tell exactly, for the War Department has bowed to the popular prejudice against the effects of tropical heat and has ordained that troops shall not remain in the Philippines more than two years, nor in Hawaii and Panama more than three.

Nevertheless, we have in the Panama Canal Zone some striking contrasts which throw considerable light on the question. The civilian population from the States are almost all employed on the Zone at occupations not requiring much physical exertion. Most of them are at indoor work; even those out of doors much of the time are merely overseers or foremen, and the heavy work is, in the main, done by Jamaican laborers. Side by side with the civilian population is the military establishment, the greater proportion of which has a certain amount of regular, outdoor exercise. And it is proverbial that, even taking due account of the difference between the average civilian and the average military age in Panama, the soldiers are more active and more energetic than their neighbors in mufti.

If we wish to carry the analysis still further, we can discover that, though the majority of the army men, those doing "straight duty," do get their beneficial exercise, there are many on "special duty" jobs, in offices, at the post exchanges, and so on, who do not have active outdoor work. And, again, it is proverbial that these last are, on the whole, a lazier lot than their comrades who drill on schedule every day all the year around. Of course, in any climate, the "worker" looks with either envy or scorn on the "soft job" of the white-collar man; and some of the charge of laziness may be attributed to this universal prejudice. But it is nevertheless true that the less active, who are employed under shade, are less fit physically and in the long run feel the effects of the tropical humidity and temperature more than those who do "squads east" and "double time" in the heat of the almost equatorial sun.

The final and almost convincing proof that a tropical climate, at latitude nearly nine, causes little or no loss of energy of itself, is found in the performance of the 29th Infantry in the spring of 1918. Tradition has it that that outfit, which had weathered nearly three years in Panama, after a hard maneuver period, hiked home under full packs about thirty miles, and taking only the briefest rests, without a man falling out. This feat was performed between one in the morning and eleven o'clock: no one could say that they had merely become accustomed to the heat, for the march was over before the hottest part of the day. Then, what is more, after a hike like this, the regiment was so full of pep that they not only marched into camp singing, but even streaked for the parade ground that afternoon and played off some postponed inter-company football games—to the wonderment of the "civies" and the military "dog-robbers."

Furthermore, we can see a similar distinction among the civilians, particularly among the children. Youngsters in Panama, like youngsters everywhere, are hard to keep in the house. They are out of doors at all hours of the day, on the playgrounds and athletic fields and at the swimming places. They feel the full force of the sun; yet they are as active as children in the States. The "climate" has no effect on them.

In fact, the climate need have no effect upon any person if he resolves it shall not have any effect. The trouble is that most people fear the climate and dodge the sun: the women because they worry over their complexions and the men because they accept a fallacious theory. The women wear broad-brimmed hats or carry Chinese parasols and, except for necessary marketing trips, come out of doors chiefly after the sun has sunk low in the sky. Consequently they lose their northern complexions and former health, from avoiding too much the healthy outdoors. The men arrive with a theory which may conveniently be summed up in a syllogism: "When in Rome, do as the Romans do." "The natives stay indoors in the heat of the day and take a nap, or 'siesta' as they call it, every noontime. We shall, therefore, have our 'siestas' and be healthy." But the logic is false. They overlook one important thing. The natives are not strong and robust, and are anything but energetic. The northern men may forget this; but the result of the syllogism is inevitable just the same. Those who follow the native rule of life, "doze off" in the middle of the day and never doff the white collar or do their gymnastics, become like the natives: just as lazy and just as unambitious.

The proper rule of life in Panama is the same as it is anywhere. Eat in moderation; sleep a proper amount—neither too much nor too little—and at the proper time; avoid "drinks," and get plenty of outdoor exercise.

The eating question is simple. Many tropical settlers agree upon a theory against overeating, especially against the excessive use of meat, in this respect following a native custom. Most northerners are quite willing to accept this theory out of deference to the dictum that they should behave as if they were in Rome. Some, of course, out of attachment to former habits, frame fantastic arguments about the dangers from a sudden change of diet and still manage to survive and to boast of their survival. Yet the fact remains that they are nervous and undernourished through too hasty eating or else phlegmatic and fatty like so many of their well-fed but not physically fit compatriots in the States.

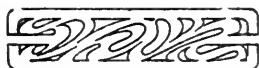
The sleeping question is likewise similar to that in the States. The man who believes that "the best of all ways to lengthen our days is to steal a few hours from night" is usually not healthy no matter whether he live in the temperate or in the torrid zone. Furthermore, below the tropic of Cancer, the daytime "siesta" and the contrast between the cool evenings and the hot days, make for a too easy violation of the usual division of sleeping and waking hours. A "nap" at noon really confers no benefit comparable to the harm it does, because it not only makes you rise from your bed in an unhealthy and unnatural perspiration but also makes you more unwilling and unready to go to bed at a proper hour in the evening. Among the men under my command it was so apparent as to deserve to be taken as almost a hard-and-fast rule, that those who did "bunk fatigue" in the afternoons were not only also the night owls of the company but also were the laziest and less energetic. Furthermore, I have seen men get into trouble and go to the guardhouse, and—in a situation where they were compelled to do "hard labor" out of doors during the hours when they were formerly in the habit of sleeping—they invariably improved remarkably in physique and in alertness.

The drink question is the same the world over. Artificial stimulation and artificial cooling is never so good as natural. Alcohol is as bad in Panama as in Paris, in its effects—and far worse in quality. Hot weather is, of course, a great temptation to drinking; but cooling drinks are universally acknowledged to be bad for an overheated person which persons in the tropics so frequently are. On warm days, drinks simply induce excessive perspiration and call for repetition. And soft drinks are just as bad. A person can be intemperate with ginger ale as well as with beer. Whiskey in excess has been the cause of many a "beach-comber" and "remittance man"; and bottled "pop" has harmed many a stomach.

The problem of exercise is really a problem of clothes. It is neither necessary nor desirable to walk as fast in Pedro Miguel as in Minneapolis.

There is not the same danger of frozen ears or frost-bitten noses; and there is the additional discomfort of perspiration. If you care for your clothes, walk in the tropics at sixty or even thirty steps to the minute instead of a-hundred-and-twenty. But the appearance of your clothing should be the only reason for a slower gait. When you have on old clothes, or are dressed for perspiring work, or do not care whom you may meet, walk at your normal gait. Above all things, every day get into such togs as you can readily have laundered and get your exercise. With sunshine every day in the year, with golf, tennis, baseball, riding, swimming, even football facilities at every hand, no man or woman on the Canal Zone need complain of lack of opportunity to exercise. And those who exercise are universally the most energetic at other things.

I write these remarks from my personal observations and experience. I did not overeat; I did not overdrink; I did not oversleep; I got my exercise regularly—on the drill ground when I was serving with soldiers of the line and on the tennis court, in the saddle, at the swimming pool and over the hurdles both then and when I was on staff duty. I made it a point to exercise regularly. As a result, I came away from service on the Canal Zone as physically fit as the day I went down, with just as much “pep,” energy, and ambition



PUBLIC HEALTH CONSIDERATIONS RELATING TO INFLUENZA, PNEUMONIA, AND ALLIED EPIDEMICS.—THE EPIDEMIOLOGICAL POINT OF VIEW¹

By F. G. CROOKSHANK, M.D., F.R.C.P.,

Physician, the French Hospital, and St. Mark's Hospital, London.

NOTE.—The accompanying article, which we are permitted to reprint through the courtesy of Dr. Crookshank, will be of special interest to medical officers and to sanitarians generally, on account of the ingenious parallel which the author draws between a great epidemic and a great war. As many of our readers know, the writings of Dr. Crookshank, along with those of Greenwood, Sir Humphrey Rolleston, and others, have attracted great attention of late in England, through his revival of Sydenham's theory of epidemics. To Sydenham an epidemic of spreading, devastating type, such as the recent epidemic of Spanish Influenza, was not a local but a cosmic phenomenon, of multiplex causation. In other words, a single specimen case of a specific infection can be studied clinically and bacteriologically by the physician as an isolated occurrence, referable to the pathogenic germ which produces it; but manifestations of such an infection in epidemic form are due to many causes, some of them beyond the reach of the physician engaged with isolated cases of the disease. The epidemic is related to cases or groups of cases of the same infection much as a war or a great battle is related to the hand-to-hand combats and group fights which initiate it. To the isolated observer, a war or pandemic appears to be "a coordinated series of happenings, in which individuals and particular sets of circumstances play their part," but due, in the last analysis, to "forces or agencies widely affecting the whole set of conditions of life upon this planet." To illustrate, Crookshank describes individual battles in the recent war as "set in motion by such controlling forces as an elderly general ten miles away, himself energized by still more distant springs of action, in London and Berlin"; but the proximate and remote causes of the European War itself will tax the ingenuity of historians for years to come. Similarly, the ultimate causation of the great epidemic of Spanish Influenza defies analysis. Wars and epidemics of this magnitude are, like those of the Middle Ages, beyond present calculation and cannot be prevented by merely deciding or wishing that they should not occur. The only device which we have, and which Crookshank advances for meeting such catastrophes, is that for which standing armies exist, viz., that "until war and pestilence are abolished, we must initiate

¹ Reprinted from *Journal of Royal Sanitary Institute*, Vol. XLI, No. 2, September, 1920.

schemes of defense"; and that the only remedy we have, in our present state of knowledge, is "to concert such measures as will fortify the whole population against the coming of the catastrophes that we, in the first place, ascribe to the inscrutable influences of natural agencies; such measures as will enable these populations to best help themselves in the face of actual danger." In this regard, the duties of the soldier are very like those of the sanitarian, and we believe that an article such as this will furnish a good fund of inspiration for both.

THE EDITOR.

ALTHOUGH I have had the advantage, in the past, of working for some years as a Medical Officer of Health, I propose now to approach the topic chiefly from the point of view of a clinician who is interested in epidemiology and the historical records of pestilence.

We speak a great deal now-a-days concerning influenza. We are all deeply interested in its control: we all realize its devastations: but how many of us are prepared to say what we mean by "influenza"?

Yet, unless we have clear ideas as to what we mean, how can we hope to formulate rational schemes for the mitigation of its ravages?

I have recently attempted elsewhere(2) to elucidate our conceptions of epidemic disease at greater length and in more technical language than would be here possible or suitable; but I would point out that we have come, through sheer intellectual laziness, to speak as if special diseases were objects of natural history, like lions and tigers, that ought to be destroyed, but that still make onslaughts upon us, from time to time, without other justification than their inherent wickedness and hatred of mankind. We have come, moreover, to look upon the causal bacillus, known or unknown, as the material expression of the disease; and we seem to imagine that the disease exists, in perpetuity, hidden in Siberia or elsewhere, whence it emerges from time to time to wreak havoc amongst the peoples of Europe and America.

All this is very wrong and very careless, for special diseases only exist as general notions, or conceptions, which we form concerning certain types of disordered health, in respect of which certain causes play a definite part. To speak then of the recurrent epidemics we call influenza as repeated invasions of the same disease can only be true in the limited sense that the war lately concluded was the same war as that of 1870; or the recent fighting in Derry the same rioting as that of 1688. In each case certain like, or even identical, causes were partly responsible for the disturbances produced in particular localities, but that is all.

The facts are that, just as the populations of continents or of countries are from time to time agitated by the organized disorder of social and political life that we call war, so are they also, from time to time, sufferers

from those disorders of the life of communities that we call epidemics, or pestilences.

And, just as from critical or analytical motives we classify the *kinds* of war we observe, as civil war, war of rebellion, war of empire and the like, so do we speak of certain kinds of disorder of the public health as plague, cholera and influenza.

But, just as war, revolution, and riot do not exist in nature as things, so there is nothing with external existence or objectivity which makes its appearance from time to time and to which we can apply the term influenza.

It is idle, therefore, to discuss whether or no the influenza of 1918-19 was *the same thing* as the influenza of 1889-90. The phenomena are comparable; but there are differences, as well as resemblances, in form, as well as in causation.

Now the bacteriologists are not more free from blame than are the physicians. They, finding certain bacilli to be generally the immediate agents in particular *cases* during an epidemic, declare these bacilli to be the cause of the *epidemic*; a position as illogical as to declare that bullets and poison gases were the cause, not merely of deaths during the late war, but of the war itself. The bacteriologists evidently forget the complexity of causation, and forget, too, that, however important from the point of view of the pathologist may be the exact nature of this or that bacillus in this or that form of disease, the real problem before the epidemiologist is to make out the nature of the factors that favour the propagation and dissemination of these special microorganisms at periodical intervals.

We, then, who are concerned to prevent, if possible, the vast epidemics that we call influenza, amongst others, must study the ultimate causes of these periodical disorders of the health of communities, just as the intelligent statesman, who would prevent war, should be less occupied with problems of artillery than with the causes that lead to conflicts.

The point of view of the epidemiologist differs then from that of the clinical physician in much the same way as does that of the statesman from that of the soldier. The physician, and the soldier, occupy themselves, during epidemics and wars with counter attack, and the protection of individuals and lesser units of communal organisation; the epidemiologist and the statesman must take a wider view in their respective spheres of interest, and must deal with origins.

Our business, then, is to enquire *why* pestilences occur; to seek a way, if way there be, of foretelling their imminence; and to consider how far they may be prevented or modified by the means at our command.

The inoculation, for example, of individuals during an epidemic, and

the adoption of measures to limit contagion are undoubtedly valuable; but they can no more *prevent* a pandemic of influenza than can gas masks and steel helmets *prevent* a war.

But, if the historical and epidemiological methods of enquiry be pursued, even though they involve mental exercises abhorrent to the laboratory worker, we may hope to arrive more nearly at a true comprehension of the influenza problem than if we confine ourselves to the purely pathological investigation of individual casualties.

It is to some results of the application of the historical and epidemiological methods that I now propose to invite your brief attention.

What *is* influenza? The pathologists cannot tell us.

From time to time (indeed, almost every year) we meet with *cases* that are diagnosed, without difficulty, as influenza; and, in some years we meet with so many cases of this fairly easily recognised form of illness, that we say "a good deal of influenza is about." These minor prevalences are apparently associated with climatic and seasonal variations, as well as with other factors.

But, at longer intervals (roughly so periodic as to occur once in a generation) there is what is called a "pandemic of influenza." All parts of the world, not simultaneously, but in rapid succession, manifest disorders of health roughly comparable to what is seen almost every year amongst persons and smaller communities, though generally in more severe form. Now, these "pandemics of influenza," as they are called, are not mere numerical aggregations of cases of seasonal influenza. And, though in battles there are certainly hand-to-hand combats, and group fights, a battle is something more than a number of combats and fights occurring simultaneously. It is a series of coordinated happenings, not merely referable to the prowess of individual combatants, or the conditions in which they find themselves, but something set in motion by such controlling forces as an elderly general ten miles away, himself energised by still more distant springs of action: in London or Berlin.

A pandemic of influenza appears also to be a coordinated series of happenings, in which individuals and particular sets of circumstances play their part, no doubt, but still, which is ultimately caused by forces or agencies widely affecting the whole set of conditions of life upon this planet.

Why is it that, at such irregular but definite intervals as to be almost predictable (like the return of a comet) by mathematical calculation, there should be such a repetition of similar and widespread disorders of health if there be not, in the background, some general factor, telluric or cosmic, involving periodic variation in the conditions of all forms of life, human, animal, vegetable and even microbic?

We know that during pandemics of influenza not only are animals affected as were, in 1918, the reindeer in Labrador and the baboons in South Africa, but that even the characters of the microbic colonists of our bodies are altered, as indeed, even on the bacteriological hypothesis of epidemics, they must be!

How else can we explain the "exaltation in virulence" of the microbes which is alleged in explanation of the increase in the number of cases of bacterial infection which, to the bacteriologist, constitutes an epidemic of influenza?

But there is another point. Although the waves of disordered health that we call influenza on the grand scale so resemble each other in their broad outlines that we ascribe them to the same disease, yet they are not invariably precisely similar in the eyes of the clinical observer.

In great pandemics the disease, as we say, seems sometimes (as in the autumn of 1918) to be mainly pneumonic; on other occasions it is notably nervous, as in 1712, and in 1801; on others, as in the 1840's, it is gastro-intestinal, or, as in the summer of 1918, it may be relatively trivial and rheumatically, or bone-aching and aguish in type.

But, in each great pandemic, whatever its predominating character, there are local foci; and in each focus there are *cases* which are either respiratory, nervous, gastro-intestinal, or aguish; and others, which partake of all these characters in mild degree, and that we call typical or simple.

Now, experience and history (which is only recorded experience), alike teach us that, though, as in 1918 and 1919, the chief and typical wave may be succeeded by a secondary, or even a tertiary wave, usually more special in character, nevertheless the great waves frequently last, in each district affected, something about six weeks from initial rise to final fall.

Moreover, for five hundred years at least, the first great wave of pandemic influenza during what I will call an influenza period (and in the last five hundred years there have been perhaps fifteen such) has been recorded as having taken the world by surprise, as if in a moment of forgetfulness: has been called a new disease somewhere, and has been given a new name by some one!

I well remember both the alarm and the facetiousness in 1889: they were reproduced in 1918, and will be again before 1950, while, I doubt not, a year or two later, at some Sanitary Congress in Siberia or Patagonia, someone will say much what I am now saying.

For what I say now is not new, but has been said every twenty or thirty years by someone since the days of the Sweating Sickness.

Historical investigation has clearly shown that what I have already hinted is a fact: that the great pandemics of influenza are not isolated

phenomena, but are each part of a series of organised disturbances of health spread over what I call an influenza period (a period during which there obtains what Hippocrates, Ballonius and Sydenham would have called a special "epidemic constitution") a period lasting, roughly for the whole world some five years or so. These influenza periods, though resembling each other as do the influenza epidemics and cases, yet differ, as do *they* amongst themselves.

But the *central* waves of influenza during these special periods stand in organic relation to the other epidemiological events of the period, just as does the battle of the Somme in 1916 to the murders at Sarajevo in 1914, and to what is now happening in Syria.

Just as wars occur during periods of historic, political, and economic importance, so do pestilences, such as that of November, 1918, occur during epidemiological epochs. We find, moreover, that, just as wars and revolutions occur in relation to local wars, Continental disturbances, periods of aggrandizement, and the like, so do these great waves of pestilence occur *after* a period, during which there are scattered local outbreaks of intensive forms of disease, sometimes pneumonic or respiratory, sometimes nervous, sometimes gastro-intestinal, and sometimes dengue like, or aguish.

Then, after the great waves comes a period of retrogression, when we reap, as it were, the aftermath, when there are again here and there scattered peculiar and intensive outbreaks of disease. Finally interest flags, memory becomes faint, and influenza is forgotten save as a kind of severe cold that happens in the winter. Mention of it and its problems disappears from the text-books; it is remembered only by the curious.

It seems clear that, if we will only profit by experience, and keep the memory of these happenings fresh, we will be able to forecast the coming storm when first appears on the horizon a cloud no bigger than a man's hand, that is to say, when these peculiar forms of epidemic disease that I have mentioned first make their appearance here and there.

The curious thing is that these premonitory and intensive outbreaks, or outbreaks of intense and peculiar forms of disease, should be so seldom recognised for what, with Dr. Hamer, I believe they are, namely, outbreaks which, though of a specialised type, are yet not to be distinguished by any specific character from what we call true influenza.

Indeed, *during* the recognised pandemics cases, of a nature indistinguishable from those seen in these peculiar outbreaks, are generally recognised as *influenza*!

But, when occurring lumped together, as it were, or in bulk, they are almost always at first thought to mean a new disease, and, more curiously still, are very frequently ascribed to forms of food poisoning.

It was so in the Middle Ages, when the Germans ascribed such outbreaks to eating salt fish, sour apples and the like; it was so in the sixteenth, seventeenth and eighteenth centuries, when epidemics similar to our present sleeping sickness were confused with ergotism; it was so in the last century, when at Paris, in 1829, the herald of the influenza of 1830 was a new disease called acrodynia, that baffled everyone, but was confidently put down to food; and again in Germany, when like happenings caused sausages to be blamed. The so-called botulism that, during the spring of 1918 preceded our Spanish influenza, is still fresh in our memories.

At the present time our American cousins are dealing with cases of like nature following this time in the wake of the passing influenza; and canned tomatoes and bottled olives are bearing the discredit.

Just before the great influenza of 1889-90 there was, at Middlesbrough an epidemic of pneumonia in which the cases were similar to those of November, 1918. High authority implicated American bacon as not unconnected with the affair. About the same time a new disease appeared in the Mediterranean isands and coastlands; food again was suspected, and an epidemic of nervous disease in Sweden, in 1888-9, which attracted attention owing to the masterly studies of Medin and others, was of the same nature as that which, in 1916, in New York, together with outbreaks of pneumonia throughout the States, should have warned us of what 1918 had in store for the world.(1)

But the few, who, like Dr. Hamer, insisted on the relation of these outbreaks to pandemic influenza, were scoffed at by those who confute what they call theories by ignoring facts.

The evidence for these particular statements and general conclusions cannot here be given, but Dr. Hamer has shown (and I have tried, by some detailed investigations, to test his conclusions) that, in considering influenza we should not confine our researches to the so-called typical cases and epidemics, but should study the recurrent periods or constitutions, during which influenza pandemics occur and we discern an ordered progression from sudden, scattered, anomalous and autonomous outbreaks of nervous, respiratory, gastro-intestinal and other forms of disease to the widespread diffusion of simple influenza with cases and foci of special character, and thence a regression, through a stage of scattered, trailing epidemics, to a normal state of seasonal prevalence and fluctuation, which lasts throughout a term of years until a new cycle commences. We are now entering upon the final phase and dealing with stragglers, not with scouts; but is not the lesson clear?

If these conclusions be valid we should be enabled, by a due prosecu-

tion of our studies, to attain some success in prognostication; and to be forewarned is to be forearmed.

But again, if our studies lead us to believe, as I think they will, that the ultimate causes of influenza periods are telluric or cosmic variations in conditions of life, we shall at least be spared the chasing of a will-o'-the-wisp. I have heard it said that belief in such ultimate causes is to be deprecated as tending to pessimism, and as inducing disbelief in the value of bacteriological methods and the like.

The only question really worth considering, is that of the *validity* of the conclusions arrived at: not their consequences. If, however, investigation on lines of historical, philosophical, and epidemiological enquiry enables us to envisage justly the relations of the phenomena with which we have to deal, then surely the statesmen, the sanitarians, the physicians, and the bacteriologists will be able to concert such measures as will fortify the world populations against the coming of the catastrophes that we, in the first place, ascribe to the inscrutable *influences* of natural agencies: such measures as will enable these populations to best help themselves in the face of actual danger.

Although, until war and pestilence are abolished, we must initiate schemes of defence; our faith in these schemes need not hinder us from taking the longer and broader view, and *vice versa*.

And, in order to prevent or minimize pestilence, we must take long and broad views; we must study the precursors of the picturesque catastrophes that strike the popular imagination: we must teach the specialists and the communities how to recognise the coming of danger, and how to reduce its incidence by organised effort and by self-control.

If we do this, the experience of one generation will not be forfeited by the next, but will be handed down, a rich legacy of increasing capacity for racial adaptation, for the benefit of those who come after us.

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BLOOD CHANGES IN THE AVIATOR

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THIS subject has been covered by the work of numerous investigators, consequently there is very little information to be added. I wish to present my findings with the desire of throwing light upon one of the points which is not so firmly established, namely, the time factor in the redistribution of the erythrocytes when the reserve supply is thrown into the blood stream. It is impossible to select a single phase from this subject for discussion because of the direct bearing of numerous other factors, such as lack of oxygen, imperfect aëration of the arterial blood with oxygen, etc.; therefore, a few will be considered in a general way.

Among the most eminent workers in this field of endeavor the following names are noted: Jourdanet, Paul Bert, Mosso, Kronecker, Kohler, Gaset, Loevenhart, Viault, Fitzgerald, Bornstein, Schneider, Havens, Douglas, Haldane, Henderson, Aberhalden, Dreyer, Walker, Zuntz, Lorraine, Smith, Goule, Jolly, Bensaude, and Weinzirl.¹

In 1878 Paul Bert predicted that the blood of man and animals living at high altitudes would be found to have a greater oxygen capacity than that of corresponding individuals living at lower levels. He surmised that the cause of this increase in the oxygen-carrying power of the blood would be found to be the decrease in the partial pressure of the oxygen in the atmosphere respired. In 1882 he gave an account of some experiments in which the blood obtained from animals living at a high altitude in Bolivia was found to contain a larger per cent of oxygen than did blood taken from animals at sea level. In 1890 Viault observed the increase (redistribution) in the number of erythrocytes per cubic millimeter of blood in himself and his companions during a three weeks' visit in Peru, at an altitude of 14,400 feet. The numerous subsequent observations which have dealt with these phenomena have confirmed the earlier data beyond doubt. Fitzgerald found that for every 100 millimeters' fall in atmospheric pressure there is an average rise of about 10 per cent in hemoglobin. She found this to be approximately constant in both sexes. Bornstein's observations on animals showed a decrease in the percentage of hemoglobin when they were exposed to a pressure greater than atmospheric. Goule's observations on three balloonists who ascended to a height of 4,500 meters had an erythrocyte count of 7,040,000, 8,800,000 and 7,480,000, respectively. The hemoglobin was, at the same time, diminished. He accordingly concluded that the increase was due to an increased production of red blood cells.

¹ Air Service Medical, South Bend, Ind., c/o Epworth Hospital.

The probable nature of this conclusion was strengthened by the fact that numerous normoblasts were found in the blood, many undergoing division. Jolly and Bensaude failed to corroborate his finding on similar expeditions. Weinzirl came to the conclusion that the erythrocyte increase was temporary and in part, at least, referable to cold. I wish to state that my observations agree with those of Weinzirl.

During the late summer of 1919 the opportunity presented itself for me to make a few observations on the blood changes in the aviator. When the first data was obtained I was flight surgeon, Post Field, Fort Sill, Oklahoma. These observations were later verified when I was stationed at Selfridge Field, Mt. Clemens, Michigan, as flight surgeon for the First Pursuit Group which was located at that Post. The altitude of Post Field is 1,200 feet and of Selfridge Field 600 feet, a difference of 600 feet between the two locations. The pilots used in the first observation did not serve in the A. E. F. Those in the second group had flown many hours over the lines. These two factors may account for the difference in the original normal counts observed between the two groups of men. The possible error in the counts due to technique should be considered in these findings.

The first investigation was conducted as follows:

1. Rise at 6.30 A.M.
2. Breakfast at 7 A.M.
3. Hemoglobin and total blood count taken at 8 A.M.
4. Ship taken off at 8.30 A.M.
5. An altitude of 10,000 feet was reached and the ship held at that elevation for thirty minutes.
6. Return to the field.
7. Hemoglobin and complete blood count made immediately after landing.
8. A complete blood count and hemoglobin estimation made three and six hours after landing.
9. This program was carried on for ten consecutive days on the six men who flew daily.

Six pilots and myself carried out this outline in minute detail.

The time consumed in reaching an altitude of 10,000 feet and returning to the field varied according to the ship used, the condition of the motor and the weather. The JN4H type of Curtiss ship, dual control, was used throughout the investigation. The average time for these ships to complete this mission was approximately sixty minutes.

In the second phase of this investigation the same roster was employed with two changes, namely, numbers 8 and 9 were eliminated and the following substitutions made:

8a. A complete blood count and hemoglobin estimation made each morning at 10 A.M. for three weeks.

9a. Flights were made on every third day instead of daily.

Group I

Days	Erythrocyte count before flight.	Erythrocyte count immediately after flight.	Erythrocyte count 3 hours after flight.	Erythrocyte count 6 hours after flight.	Erythrocyte count 48 hours after flight.	Erythrocyte count 72 hours after flight.	Erythrocyte count 84 hours after flight.	Leucocyte count before flight.	Leucocyte count 84 hours after flight.	Lymphocyte count before flight.	Lymphocyte count 84 hours after flight.	Hemoglobin estimation before flight.	Hemoglobin estimation 3 hours after flight.	Color Index before flight.	Color Index 3 hours after flight.
Lt. S.— 1-3 19-21.....	5,100,000 5,110,000	5,324,000 5,400,000	5,396,000 5,386,000	5,390,000 5,398,000	5,300,000 5,200,000	5,184,000 5,112,000	5,126,000 5,102,000	63%	62%	36%	36%	95%	100%	.93	.94
Lt. P.— 1-3 19-21.....	5,326,000 5,348,000	5,496,000 5,386,000	5,496,000 5,352,000	5,392,600 5,348,000	5,336,000 5,346,000	5,340,000 5,350,000	5,328,000 5,348,000	65%	65%	33%	34%	98%	102%	.92	.94
Lt. V.— 1-3 19-21.....	5,743,000 5,746,000	6,043,000 5,986,000	6,020,000 5,954,000	5,998,000 5,980,000	5,896,000 5,886,000	5,800,000 5,824,000	5,754,000 5,786,000	64%	64%	33%	35%	98%	100%	.86	.83
Lt. G.— 1-3 19-21.....	5,500,000 5,602,000	5,984,000 5,664,000	6,000,000 5,696,000	5,986,000 5,600,000	5,636,000 5,603,000	5,488,000 5,606,000	5,506,000 5,604,000	62%	61%	35%	38%	100%	110%	.90	.92
Lt. C.— 1-3 19-21.....	5,834,000 5,800,000	6,038,000 6,096,000	6,002,000 6,093,000	6,024,000 6,090,000	6,004,000 6,080,000	5,960,000 6,020,000	5,842,000 5,803,000	64%	63%	33%	35%	100%	108%	.86	.96
Lt. K.— 1-3 19-21.....	5,634,000 5,696,000	5,948,000 5,810,000	5,942,000 5,796,000	5,940,000 5,758,000	5,880,000 5,724,000	5,796,000 5,700,000	5,700,000 5,700,000	65%	66%	34%	34%	100%	112%	.89	.94
Lt. C.— 1-3 19-21.....	5,024,000 5,035,000	5,420,000 5,484,000	5,500,000 5,500,000	5,496,000 5,432,000	5,300,000 5,296,000	5,148,000 5,100,000	5,086,000 5,026,000	60%	60%	35%	38%	90%	100%	.90	.92

Group II

Capt. C.— 1-3 19-21.....	5,112,000 5,118,000	5,206,000 5,204,000	5,218,000 5,222,000	5,218,000 5,186,000	5,200,000 5,184,000	5,110,000 5,120,000	5,140,000 5,120,000	65%	65%	33%	34%	95%	100%	.93	.96
Lt. M.— 1-3 19-21.....	5,402,000 5,360,000	5,800,000 5,520,000	5,604,000 5,500,000	5,656,000 5,400,000	5,492,000 5,400,000	5,404,000 5,400,000	5,406,000 5,360,000	65%	63%	32%	35%	98%	104%	.90	.93
Lt. H.— 1-3 19-21.....	5,482,000 5,500,000	5,622,000 5,712,000	5,612,000 5,700,000	5,500,000 5,684,000	5,498,000 5,600,000	5,500,000 5,600,000	5,500,000 5,560,000	63%	64%	33%	35%	98%	110%	.90	.98
Lt. T.— 1-3 19-21.....	5,346,000 5,300,000	5,482,000 5,414,000	5,510,000 5,450,000	5,496,000 5,432,000	5,402,000 5,400,000	5,388,000 5,384,000	5,350,000 5,310,000	64%	64%	33%	33%	97%	102%	.91	.92
Lt. W.— 1-3 19-21.....	5,234,000 5,260,000	5,318,000 5,310,000	5,400,000 5,382,000	5,400,000 5,354,000	5,400,000 5,300,000	5,312,000 5,250,000	5,248,000 5,250,000	63%	64%	34%	35%	96%	100%	.92	.92
Lt. B.— 1-3 19-21.....	5,424,000 5,486,000	5,512,000 5,488,000	5,584,000 5,516,000	5,520,000 5,500,000	5,500,000 5,500,000	5,450,000 5,500,000	5,438,000 5,488,000	64%	63%	33%	36%	98%	101%	.90	.93
Lt. C.— 1-3 9-21.....	5,020,000 5,032,000	5,116,000 5,422,000	5,138,000 5,430,000	5,112,000 5,386,000	5,100,000 5,114,000	5,050,000 5,082,000	5,032,000 5,050,000	64%	61%	32%	37%	90%	95%	.90	.93

The results were charted for comparison with the preceding data.

In the third phase of this investigation, I alone followed the routine program as listed above but eliminated numbers 7, 8, and 9 and substituted the following:

A flight once a week, or every seventh day.

I secured blood specimens while in the air at an altitude of 10,000 feet after thirty minutes had elapsed at that elevation. This was by no means an easy task. The ship's movements and the disturbed atmosphere caused failure many times. Often several attempts were made before a satisfactory specimen was obtained. Three blood-counting pipettes with extra necessary equipment were always carried. A tallquist hemoglobin scale was used in this individual observation.

The second series of investigations, conducted at Selfridge Field, were carried out in the same way except that voluntary members of the First Pursuit Group replaced the pilots used in the first group.

The table for the first phase of this investigation was omitted inasmuch as the data in the one presented practically covers the same findings.

The only additional information obtained from the findings tabulated on the observations taken on myself was a very slight increase in red blood cells and apparently no perceptible change in the percentage of hemoglobin. Consequently this table was omitted.

Considering the data herewith tabulated and charted I find an increase or redistribution of the red blood corpuscles in the general circulation and also an increase in hemoglobin percentage as well as the total amount in the blood of the body. A possible explanation for the hemoglobin increase in the case of the aviator is that the redistribution or increase in the erythrocytes in the general circulation, caused by stimulation (altitude, cold, lack of oxygen, etc.), remains in the circulation approximately 96 hours, during which time the pressure has been reduced and the oxygen increased (by refraining from flights). The normal erythrocyte count at sea level ranges from 4.5 to 5.4 million per cubic millimeter. In the case of the aviators examined it ranged from 5.0 to 5.8 million per cubic millimeter. It averaged approximately 5,500,000 per cubic millimeter. Several red blood cell counts were made from pilots at 10,000 feet altitude at room temperature (about 26 C.) while they were receiving the rebreathing examination and they consistently ran somewhat lower than those who actually reached that altitude by flight. This would suggest that temperature (cold) augments or in some way influences the redistribution of red blood corpuscles. In the opinion of Weinzirl this increase or redistribution of red blood corpuscles is temporary. This coincides with my findings in the case

of men who flew once a week or less but in those who flew more frequently there apparently was a slight permanent increase in the red blood corpuscles and a more marked increase in the hemoglobin percentage. According to my observations the redistribution or increase in erythrocytes takes place within one hour and reaches its maximum height within three to six hours. The count remains at that level, perhaps fluctuating slightly, until 48 hours has elapsed, then gradually falls to normal at the end of 84 to 96 hours if the aviator does not participate in flights during that interval. In some instances it falls below the first count and in others it remains higher. This may be explained by the difference in the mechanisms controlling this phenomenon in individuals. The leucocyte count was not affected, apparently. The lymphocyte count showed a tendency toward a slight increase which could not be considered abnormal for those other than aviators. The color indices were slightly higher after flights. This is perhaps also explained by the same possible causes which increased the hemoglobin percentage which is discussed in another part of this paper. It has been shown by other investigators that the increase in hemoglobin and red blood corpuscles for an individual fluctuates in any two or more observations even though carried out under the same conditions. The altitude of the Post may exert an influence on the blood change.

CONCLUSIONS

1. The hemoglobin and red blood corpuscles in the active aviator are increased when the controlling mechanism is stimulated by flights.
2. The increase begins to take place within the first six hours after stimulation.
3. The increase fluctuates according to the individual and the controlling mechanism.
4. These blood changes are temporary and will become normal within 96 hours, on an average, if not disturbed.
5. The normal red blood corpuscle count for healthy active pilots ranges from 5.0 to 5.8 million per cubic millimeter and the hemoglobin per cent is approximately 100.
6. Temperature (cold) augments the increase in red blood cells.
7. The normal red blood cell count and the hemoglobin for active air pilots are slightly higher than that of other individuals.
8. The leucocyte count is apparently not affected.
9. The lymphocyte count in the active aviator is slightly higher than in the normal individual.

10. The color indices are slightly higher normally in the pilot, but markedly so a few hours after flight.

I wish to thank Lieut. Col. Davenport Johnson and Lieut. Col. Richard B. Barnitz for permitting me to make these observations, also those officers of the Medical Corps whose willing coöperation made it possible for me to collect this data.



THE EFFORT SYNDROME TOGETHER WITH A CONSIDERATION OF THE SIGNIFICANCE OF CERTAIN MURMURS

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THE war has altered opinion of the value of many signs formerly accepted as important indications of the presence of organic heart disease. The chief sign involved in the changed point of view is the systolic murmur. The significance attached to diastolic murmurs, both the diastolic murmur of aortic insufficiency and the presystolic murmur (auriculo-systolic) of mitral stenosis, has remained unaltered. Individuals afflicted with these two diseases have been found not to bear the strain of war satisfactorily, even if at the time of enlistment they were free of any indication of heart failure. They are now accordingly rejected for service.

The significance of systolic murmurs, especially their relation to mitral insufficiency, however, has occasioned much discussion. Systolic murmurs occur in so large a number of individuals that it has become necessary to decide when they are important and denote mitral insufficiency. The need for making the distinction between important and unimportant systolic murmurs occurred infrequently in civil life; young men rarely sought medical advice on account of such murmurs. When they did, as the result of life insurance or other accidental examination, the difficulty in diagnosis was appreciated, but reliable guides for making a decision were wanting. Early in the war men with such murmurs were accepted and many were found, after severe service, to bear the fatigue incident to campaigning satisfactorily. The conclusion was, therefore, drawn that the murmur in itself must in these instances be considered unimportant. New criteria were accordingly required to decide which systolic murmurs were, and which were not, important.

Until now it has been customary to divide murmurs into two groups, functional and organic. To decide in which group a murmur belonged, it was studied from the point of view of the bearing on it of the posture of the body, of the position in the precordial area at which the murmur was best heard, of its character on auscultation, according to its intensity in different respiratory phases, according to the direction of its transmission, and according to its time incidence in the cardiac cycle.

A word should first be said on the use of the words "functional" and "organic" in relation to murmurs. A murmur is of course a physical phenomenon and dependent on the structure of the containing vessels

and the arrangement of the surrounding tissues for its production and character. This is true of the so-called functional murmur as well as of the organic variety. All murmurs are in this sense organic. The distinction which the words "functional" and "organic" were intended to convey relates to their importance or unimportance, or perhaps better, to their significance or insignificance. The point is in itself not important except in the interest of clear understanding.

Close study has failed to show that systolic murmurs can be classified as significant or insignificant according to the criteria just enumerated—that is to say, posture, position, character, respiratory emphasis, transmission, and position in the cardiac cycle. It is of course true that aid may be obtained from certain of these criteria but the aid is not definitive. Other criteria have therefore been proposed. These relate (1) to the size of the heart, (2) to the history of infection, especially of rheumatism, (3) to the intensity of the second sound in the second left interspace or third left costo-chondral junction, and (4) to the reaction to exertion. A candidate may be accepted for service in the Army if his heart is normal in size, if there has been no history of rheumatism, if the second cardiac sound is not accentuated, and if the response to a standard exercise test is normal, even though a systolic murmur is present. The terms used require explanation.

1. The heart is normal in size in adult males in civil life in the third decade, when in the oblique position it measures from 9.0 cm. to 11.0 cm. In active military service the size often increases to 11.0 to 13.0 cm. and these dimensions are considered normal. The measurements given are based on X-ray plates placed, when exposed, 2 meters from the target of the X-ray tube. Attention must be called in this connection to the fact that all normal hearts do not lie in this oblique position in the chest. Frequently their outline shows them to have a more vertical position in the mid-thoracic region; sometimes they have a more nearly transverse position. These variations naturally make the diagnosis of hypertrophy difficult and must be taken into consideration in deciding on its presence. An hypertrophied vertical heart may in profile be smaller than a normal transverse organ. In every instance, therefore, a correct estimate of size may not be possible.

The second criterion mentioned is the *history* of infection, and especially rheumatism. Under rheumatism are included acute rheumatic fever, chorea, torticollis, tonsillitis, growing pains. It is obvious that a single attack of acute rheumatic fever occurring in childhood, and having been followed by no obvious cardiac disability, is not important as are repeated attacks, the last having occurred within the year.

The third criterion relates to the intensity of the *second sound*. It is not possible to state that the second sound is invariably accentuated when chronic mitral endocarditis has persisted for a prolonged period, but it is believed to be the rule that after long-standing disease an accentuation takes place. Its presence is therefore of significance in deciding that disqualifying disease has occurred.

The nature of the *response to a standard exercise test* is the fourth criterion. The introduction of the test is important for it gives information of what one desires to know as the result of examination; that is to say, the ability to undergo exertion. The test recommended in Circular 21, S. G. O., consists in hopping 100 times on the left foot so that the shoulder is elevated from 4 to 6 inches. Two minutes after the end of this exercise the ventricular rate should return to within 10 beats of normal and the blood pressure to normal. The test is recommended because it is simple and can be carried out in a uniform manner.

It is not pretended that one can rely on these criteria always to solve a difficulty in diagnosis when a systolic murmur is present. But they are useful when, in addition to the murmur, the heart is barely enlarged and a history of repeated and recent attacks of rheumatic fever is reported.

A word should be said about the character of the apex impulse. It has been the habit to lay stress on its extent and position and on the force or other slight abnormalities presented by it on palpitation. Recently abundant experience has tended to confirm one in the impression that too much stress is laid on these phenomena. But as an indication of the position of the left border of the area of cardiac dullness, in estimating hypertrophy the location of the apex, especially its furthest extension to the left, is valuable.

These views in respect to the systolic murmur represent the chief alteration which has been made in the point of view of organic heart disease. Of far greater importance is a symptom complex, functional in nature and, although not confined to soldiers, especially common in war. It is a group of symptoms, referred by soldiers to the cardiovascular system, and forming a frequent cause of more or less serious disability. This group of symptoms was first described as a clinical entity during the Civil War in the United States by Harthorne and the description was later elaborated in greater detail by DaCosta. By the latter it was called the "Irritable Heart of Soldiers"; and the disorder was known by this name until the present war.

The reason for its occurrence was sought in our own and other armies. Its cause was laid first to one and then to another circumstance. It was found everywhere and under all conditions. During the present

war attention was forcibly directed to the affection because of the large numbers of soldiers whom it involved. With the new work on the subject, the name of Thomas Lewis is closely connected. His recommendation that the affection be known by the term "Effort Syndrome" has fortunately been accepted in the American Expeditionary Forces. It is classed in the British Service as Disordered Action of the Heart. (D. A. H.)

The affection is characterized principally by the occurrence of breathlessness, giddiness, a sense of fatigue, pain in the chest, often in the region of the precordium, and palpitation. On examination are found, in addition, an anxious facies tremor or shakiness of the fingers alone or of the extremities or even of the whole trunk, cyanosis, sweating, skin hypersensitiveness, both hyper- or hypo-esthesia (Head Zones), tachycardia; and on questioning one learns besides of headache and of unpleasant dreams at night. Many of the symptoms suggest the presence of the heart failure of chronic valvular disease. It will be seen, however, that this affection is strikingly different. It need scarcely be pointed out that both conditions may coexist.

Naturally all these symptoms are not necessarily present in the same patients, and besides, the individual symptoms vary in the degree of severity. Indeed, the clinical picture varies within wide limits. In consequence, experience is required in order to recognize the cases, especially in the milder forms. Patients may, in fact, complain of a single symptom only. The most frequent of them, according to Hume, is pain in the chest occurring in 768 of 1,000 cases. Breathlessness comes next (675), then giddiness (403), palpitation (354), precordial tenderness (268), fainting with loss of consciousness (98) and fainting without loss of consciousness (25). As a matter of fact it happens frequently that only a single of these complaints causes the soldier to report at sick call. But in addition to his complaint, suppose it to be precordial pain, he is likely to look worried, his face drawn, his brow contracted, his eyes unduly anxious, his hands and fingers ashake. Questioning may elicit the fact that he suffers from headache, bad dreams at night, pain of a fugitive nature elsewhere in the body, and an increasing disability to do work. Examination discloses the presence of certain physical signs, to be discussed later. While the clinical picture which has just been drawn is common, the especial cause for sick report may be one of the other chief symptoms. Indeed, any one of the chief complaints enumerated may appear alone and dominate the clinical picture. Experience must teach the large variety of combinations in which the chief symptoms occur. The peculiarities they present deserve detailed consideration.

The *pain* is usually located in the precordium or just above and to

the left of it. Its position is not necessarily fixed; it may change from day to day. It may be felt on the right side of the chest, in the flanks or elsewhere. Sometimes, though, it is referred to the shoulders and arms. When the pain is in the chest, its character is usually sharp, sticking, and fleeting, rarely constricting. It is probably not experienced at night and it does not keep the patient awake. Effort tends to bring it on, just as it tends to bring on the other symptoms. Associated with the pain, areas of skin hyperesthesia (Head Zones) are found in a quarter to one half the cases. The intensity of this symptom varies. Patients may complain of it as due to the pressure of clothing; in other instances its presence is elicited on examination. Pressure between the fingers of the pectoral, deltoid, sternomastoid muscles, may elicit unilateral or bilateral tenderness. Boas (personal communication) has, in a similar manner, found areas of hypoesthesia. The frequency with which this occurs is not known.

Breathlessness is likewise a common complaint and often the sole one. It interferes altogether with the normal performance of duty, such as a route march. It may be impossible objectively to detect the symptom, but not infrequently the distress is obvious. The rate of the respiration may be much elevated, especially as the result of effort; frequencies of 60 to 80 per minute have been described. The relief from effort and the recumbent position usually are followed by the return of breathing to normal. But dyspnea, even when the degree is so striking, does not require the patient to be propped up in the way that heart disease does. Patients sleep quite flat or on one pillow and the rate of breathing is normal. Cough and expectoration are not prominent.

There is, however, one type of case in which difficult breathing comes on, especially at night, in the form of attacks of nocturnal asthma. Such attacks are probably limited to those cases of the Effort Syndrome which have, in addition, been gassed. They are manifestations of gas poisoning rather than of the Effort Syndrome. They come on rather late (4 to 6 weeks) after the gas attack. It is a form of respiratory distress which requires special mention under treatment.

In connection with breathlessness are often combined the sensations of extreme *fatigue* or lassitude and *giddiness*. The sense of fatigue alone may be so great as to be incapacitating. Walking on a level for one hundred yards may suffice to engage all the patient's effort. Carrying light equipment, using a shovel or rake, may be quite beyond the individual's strength. Muscular tone may be low. The patient is then unable to resist the examiner's effort to extend the arm when he has previously been directed to hold it flexed. The muscular weakness may indeed be general.

Giddiness is a very common complaint. It is a type in which objects external to the patient apparently do not tend to circulate about him; it is expressed rather as a desire on his part to steady himself against the impulse to fall. Black spots and other abnormal visual phenomena, common in the vertigo of hypertensive circulatory diseases or in chronic nephritis, are not prominent complaints.

Attacks of *fainting* occur in a moderate number of men. Sometimes consciousness is retained, more often it is lost.

Cardiac palpitation is a common symptom. It may accompany elevation of the pulse rate but it need not do so. It may persist during rest.

Examination of the patient brings out a number of signs in addition to those to which the patient has attracted attention. Prominent among these are tremor, sweating, and tachycardia. The *tremor* is coarse and is a shake rather than a tremor. It involves not only the fingers and hands but occasionally all the extremities and the head and the entire trunk as well. Patients who have it in a marked degree, and have the anxious facies as well, present a distressing picture. But the importance of the tremor, striking sign that it is, is easily exaggerated. Examples of it are widely distributed. It may occur in men who give no evidence of suffering from the Effort Syndrome. It is found, in fact, in great numbers of men who have never been away from a base port; on the other hand, it is entirely absent in equally large numbers of men who have served fairly long periods in the trenches and have sustained wounds. When it is associated with the Effort Syndrome, its prominence overshadows the picture, but in spite of that it has not, for the reasons given, been found valuable as a guide in diagnosis nor as an index of progress in treatment.

Profuse *sweating* is common, even when the weather forms no adequate reason for it. Sweat may stand on the face and drop from the axillæ. And there are other evidences of hyperactivity of the skin such as for instance the occurrence of weals on stroking. The occurrence of Head Zones, both of hyperesthesia and hyposthesia, has already been mentioned.

Of special interest is the examination of the *heart*, to which most of the symptoms, as pain, breathlessness, tachycardia, fatigue, are naturally referred. The *pulsation* of the precordium is often striking and may extend as a wave-like motion over two or three intercostal spaces. The thrust forward of the *apex impulse* may be especially forcible. It is often in fact *felt* to be so. A thrill is not felt, but very frequently the impulse is not the simple, single thrust normally experienced, but rather is split, giving the impression of a major thrust split into a succession of

ill defined minor parts. One is reminded of the thrill in presystole of mitral stenosis. But the thrill in mitral stenosis differs distinctly from this especially in the matter of its timing; this one, due no doubt to overaction, occurs distinctly in systole, at the time of the first sound. A single sharp shock, synchronous with the second sound, is also often felt both at the apex and at the base. In *size* the heart is not enlarged; indeed, measurement¹ made from teleroentgenograms show that it tends to be smaller rather than larger than normal. An exact statement of size is, however, difficult to give. Normal size depends on the nature of the individual's activity. It is generally admitted that in the soldier on active field duty, the average size is usually greater by two centimeters than was his heart before enlistment. Estimations of size should take this fact into consideration. The expected total transverse measurement may be given as between 11.0 and 13.0 cm. It is doubtful whether in the Effort Syndrome cases, taking these facts into account, enlargement takes place. The precautions already urged in estimating the size of the heart apply, of course, equally here. On *auscultation* much difficulty has been experienced in distinguishing what one hears from the signs of mitral stenosis. The first sound is often unclear; it has, as one might have expected on palpation, a serrated quality, the serrations being equal, confined within the limits of the first sound and replacing it. But it is precisely these serrations that cause confusion with the presystolic murmur of mitral stenosis. It need not be pointed out that serrations in the first sound are not the same as the crescendo murmur before that sound.² When the rate of the heart is elevated, as is so often the case, the difficulty of accurate auscultation is naturally increased. Usually the second sound is not accentuated either at the apex nor in the base areas. The absence of accentuation is a sign of value, for although the following can not be said always to be true, it is nevertheless generally the fact that where mitral stenosis is actually present the second sound is accentuated. The liability to confusion is emphasized because the error in diagnosis has frequently been made and has wrought harm not only to the service but also to diagnostic standards. Occasionally the diagnosis of mitral stenosis is made because, in recent years, students and physicians have been urged not to fail to make this diagnosis even if the rumbling prestystolic murmur is absent. They have been told that a snapping first sound suffices to establish the presence of the disease. The warning is proper but insistence ought also to be laid on the fact that then an accentuated second

¹Medical Research Committee, Special Report Series No. 8.

²It is appreciated that insistence on the crescendo character is not quite proper, for as Gerhardt has pointed out, the crescendo character of the murmur is not a property of its own but is lent to it, because it terminates, when the P R time is normal, in a sharp first sound.

sound should be looked for and be found present. It is not contended that the diagnosis of mitral stenosis can not or should not be made unless the characteristic murmur is present. The murmur is in fact not always present. But insistence should also be laid on the fact that then the diagnosis be made after due attention has been given to the history of the patient and to exact auscultation. Anxiety to avoid one error has led many into making the other. On occasion it is a difficult matter, even after all precautions have been taken, to be certain that a presystolic murmur is present. Various maneuvers have before now been recommended to make it evident; such as altering the posture of the patient, holding the breath, undertaking exercise. Morison and Lewis (personal communication) have recently hit on another method, which they say is effective in certain instances. They lay the patient in the recumbent posture and place the bell of the stethoscope at the site where it is anticipated a presystolic murmur may be heard. The patient then inhales 3 minims of amyl nitrite. During the first 10 to 20 beats the only change heard is an acceleration in rate; during the second 10 to 20 beats the anticipated murmur may appear; during the third 10 to 20 beats the murmur usually disappears. The duration of the test is short. Auscultation must be practised continuously throughout its performance.

The Effort Syndrome is not associated with a disturbance in the *rhythm* of the heart. Regularity, except for sinus arrhythmia which is a normal phenomenon, is maintained. Although the affection does not involve a disordered action of the heart (D. A. H.), irregularities may naturally be found, as they are found accidentally in any large group in the community, but they are not a factor in the syndrome.

The *rate* of the heart beat is usually accelerated. The range (Table I) is between 90 and 110 in 46.2 per cent and between 110 and 130 in 26.0 per cent of the cases; or between 90 and 130 in 72.2 per cent of the cases. These figures are taken from Hume. There need be no elevations as the table shows. It is perhaps important to point out that the rate tends to be unstable. In the same individual it may on the same or on successive days fluctuate between wide limits. Sometimes, of course, stability at one or another level may be maintained. The fact of instability is mentioned especially because of the tendency to use cardiac rate in estimating prognosis.

The *significance of the affection* we are considering has been the subject of a great deal of speculation. Certain suppositions in regard to its cause may be dismissed immediately; the importance of others must be weighed. And first may be dismissed the thought that there are racial predispositions toward its occurrence. During the war, cases have been

found in all the Armies, Central as well as Allied. And among the Allies it is found in Hindustani, Scotch, Irish, Welsh, Canadians, Australians, and New Zealanders. No race domiciled in the United States is free. It is found in non-smoking peoples, like East Indians, as well as in smokers. It can not, however, be said that smoking is harmless, so far as aggravating the condition is concerned. Investigation has not shown that it is dependent on a specific infecting organism, nor is it always associated with the occurrence of trench fever or rheumatism. Many who have had both diseases have not become subject to the Effort Syndrome. The liability, however, of men who have suffered from infectious diseases and especially from trench fever to suffer from the Effort Syndrome should not be overlooked. A point of especial importance relates to the tendency of trench fever to recur. Attacks are known to come on after afebrile intervals. The recurrences must be taken to indicate the possibility of residual infection. In view of the fact that on occasion tachycardia and its attendant symptoms are alone manifest, the infection itself may be regarded as involving the heart. It will be recalled that occurrences exactly similar are encountered in convalescence from typhoid fever, dysentery, influenza. The relation of the Effort Syndrome to acidosis is too vague to attach importance to the few uncertain experiments which have been reported. By the method of respiratory analysis Wilson and Levine (personal communication) failed to find that a deviation from the normal exists.

Of more importance is the possibility of the disturbance of thyroid secretion. Symptoms associated with Graves' disease are in some respects like these found in the Effort Syndrome. The symptoms in common are nervousness, tremor, and tachycardia. In the Effort Syndrome exophthalmos or thyroid enlargement are usually absent. There need be no diarrhea. Tachycardia may be absent. The tremor is really no tremor, but a shake, and attains degrees of severity never seen in the most advanced cases of exophthalmic goitre. On the other hand, when tachycardia in Graves' disease develops to as high a rate as is attained in the Effort Syndrome, there is usually a certain degree of dyspnea as well, and the size of the heart is definitely increased, whereas there is no reason for believing that this occurs in the Effort Syndrome. Between the conditions a striking difference is observed at night. When tachycardia and dyspnea in Graves' disease are sufficiently severe to attract attention they persist, as a rule. In the Effort Syndrome, on the other hand, both disappear. The presence of small thyroid tumors or slight symmetrical enlargement of the gland can scarcely be taken as evidence in favor of hyperthyroidism. Such enlargements occur in large numbers of persons in certain sections of the United States as

elsewhere. They are not necessarily accompanied by symptoms either of developing Graves' disease or of the Effort Syndrome.

The fact is appreciated that in the minor grades of both conditions, the symptoms may be vaguely defined and might easily be confused. Investigations should be instituted with the view of developing specific methods of diagnosis in the early stages. Such studies should yield important results for diagnosis and consequently for treatment. In the later stages, when the cardinal symptoms of both are well established, no difficulty exists. For the present, reliance in diagnosis must be placed on the symptoms and signs already described.

A word should be said about those cases of the Effort Syndrome which occur after gassing. Confusion has occurred in relation to them. Many gassed cases have the symptoms of the Effort Syndrome; many, however, have not. But both groups develop the symptoms of nocturnal asthma to which reference has already been made. They have been found to have polycythemia as well. Barcroft and Haldane and Meakins deserve credit for having called attention to this group of patients. Both symptoms, asthma and polycythemia, are properly ascribed to a late stage of gassing. They may, of course, occur in individuals who have also the symptoms of the Effort Syndrome. But it must be clearly understood that such patients are sufferers from two complaints, late gassing and the Effort Syndrome. The two are not necessarily associated.

The most difficult part of the subject to discuss is its relation to the war psychoneuroses. In their pronounced forms, these naturally present no difficulty in diagnosis. Neither do the Effort Syndrome cases without psychoneurotic symptoms cause difficulty. But there are cases in large numbers which exhibit symptoms belonging to both groups. These cases present a twofold problem, one in classification or diagnosis, the other in therapy. The difficulty in diagnosis lies at the very root of the problem. There is no disposition to add new elements of confusion to the subject, but another attitude toward the subject must be suggested. It is a fact that many Effort Syndrome cases have not arisen *de novo* as the result of the war. The taking of proper histories brings out the fact that the beginning of the affection is of long standing. The complaints were initially too insignificant and too little insistent to require serious attention. During military service, however, the civil factors of safety fail to suffice for the individual's protection, the defect becomes prominent and the individual suffers. The important point is that the affection is of long standing but latent. It requires a stimulus like the stress of war to make the trouble latent. The stimulus becomes

operative in a manner already habitual to the individual; this reaction is cardiovascular.

Those classed as psychoneurotics have a similar history. The stimulus which drives their latent defects into consciousness is the same. They differ in that their previous histories and their personal psychology predispose them to a different reaction. The manifestations of their affection lie in the domain of neuropsychiatry and require no detailed description here.

There is another group of more complex nature the individuals in which react to the stimuli of war by more and more varied manifestations, partly psychoneurotic, partly cardiovascular. In the same way reactions may be found which are, for instance, gastro-intestinal or muscular. In all these varieties the stimuli furnished by the war may be similar. The reaction is a matter partly of chance, partly of predisposition.

TREATMENT

Lewis has offered a most important contribution to the methods for managing the malady, especially from the military point of view. For this purpose there was required a technic for sorting men in grades for service. He concluded that the proper way of sorting men for physical exertion was to try out the men by physical tests. It was an obvious conclusion. Lewis succeeded in doing this by a system of graded exercises. The system works admirably as is seen by the fact that in a certain group, after eleven months of service, the classification then made proved to be substantially correct. But the limitations under which work was done at the British Military Heart Hospital no doubt prevented the introduction of additions in treatment which a consideration of the affection indicates are obviously desirable.

The variety of origin of the cases must be remembered in arranging for their management. Some are convalescents from acute infections, especially trench fever, bronchitis, pneumonia. The management of convalescence after these infections must be designed to safeguard patients from damage dependent on the relighting of their infection. Relapse after trench fever is known to occur with moderate frequency and should promptly be recognized. When it occurs, it is thought to depend on an involvement of the heart muscle. In such circumstances, physical exertion is naturally not indicated. Other cases are of men who have been gassed. Others have been of long standing and existed before the war. Still others have obviously showed no predisposition to the affection before the war. In any case, the principles of treatment are the same. The general rules of hygiene must, of course, be observed. The men should be made to understand that they are not

ill. They should, therefore, not be collected in hospitals. In hospitals, moreover, the constant contact with disease and the suggestions arising from this contact are undesirable but unavoidable. The proper environment for them is supplied by camps under suitable medico-military discipline. It is necessary to insist on the medical rather than the military side of the management, although there should be no underestimation of the importance of military discipline. The discipline must be rigid, but appropriate to the degree of disability of the men. Occupation must be found for them, and especially occupation for their minds. It is an error to permit them to rely on their own resources alone. When this side of their treatment is neglected, they speedily become bored, listless, and undisciplined; they begin to brood on their disability until their mental background, deranged in the first instance, is worse in the last state than in the first.

In practice, attention should be given to the minor sources of infection, such as infection of the accessory nasal sinuses, the teeth, tonsils, ears. These infections should be removed. Physical exercise should be arranged for them. Three methods are suggested: drill, farm or garden work, and games. The drill should be graded according to the ability of the individual to perform it. It can be varied both as to severity and as to duration. At best, however, drill can occupy only a small portion of the day and may be supplemented by route marches. Farm and garden work can, of course, also be adapted to the capacity for endurance of the individual for work of this kind. It has the advantage of variety and may be performed without that nervous strain which the sharp orders given at drill by the drill sergeant necessarily entails. The introduction of games invites men unconsciously to undertake a great deal of physical exercise without that feeling of compulsion which attaches to the other forms of exercise. Their number may be added to and varied by the imagination of the medical officers. To the forms of exercise may be added, if the facilities are presented, training in occupations of use in the Army. Advice as to these must be sought from time to time. Men are constantly wanted as stenographers, typists, telegraphers, mechanics in gun, automobile, or wagon repairing, railway attendants, and hospital orderlies.

The mention of disturbance in mental background leads naturally to a consideration of the share neuropsychiatrists must have in the treatment of certain of the cases. In point of fact, even when the symptoms are predominately cardiovascular, the neuropathic side of the picture is frequently prominently developed. The importance of this side of the therapeutic problem, if neglected, may actually increase during the period of treatment. The requirements for aid in this

direction vary. The difficulties may be mimetic or inherent in the individuals. And again some men, reticent by nature, are troubled, in the attempt to suppress interest in their symptoms, by dreams of an uncomfortable kind.

It has been the purpose of this exposition to indicate the general features of this affection of soldiers. The attempt has been made to show how involved the symptom complex is, and how it touches intimately other domains in medicine aside from cardiovascular. Its etiology can not now be conscientiously indicated nor its exact relation to the numerous processes involved, which are familiar and the connection of which with this entity immediately suggest themselves. It is impossible to lay down rigid laws for treatment; they may be done only when the exact pathological physiology is established. But suggestions are made for dealing with the problem not only for the purpose of sorting, which is purely military, but also for the purpose of therapeutic improvement, which is the aim of clinical medicine.

TABLE I

<i>Pulse rates</i>	<i>Per cent</i>	<i>Pulse rates</i>	<i>Per cent</i>
40- 50.....	0.1	110-120.....	14.7
50- 60.....	0.5	120-130.....	11.3
60- 70.....	1.8	130-140.....	1.4
70- 80.....	8.5	140-150.....	0.9
80- 90.....	13.5	150-160.....	0.1
90-100.....	22.4		
100-110.....	23.8		



THE INSTRUCTION AND TRAINING OF OFFICERS OF THE MEDICAL DEPARTMENT¹

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AT THE GENERAL SERVICE SCHOOLS

1. If recommendations now under consideration by the War Department are approved there will be detailed annually, beginning with the session of 1921-22 and continuing thereafter as an established practice, four officers of the Medical Department to the School of the Line, such numbers, probably two, as are recommended from the preceding to the General Staff School, and two to the General Staff College. To quote from G. O. 56, War Dept. c.s. on the subject of "Military Education in the Army" the training of officers (Regular Army, National Guard, and Organized Reserve), both in the schools and in practical training, must have as its mission the task of providing a suitable corps of officers for the United States Army covering:

(a) The organized peace establishment as developed under section 3 of the National Defense Act, as amended.

(b) Such additional trained officers as may be necessary to carry out a complete and immediate mobilization in the event of a national emergency.

2. Taking the foregoing as in general the combined mission of practical training and the training in our schools, the following can be considered as the mission of schools for officers: To provide officers trained correctly in theory and practice for all positions in command and staff for the Peace Establishment of the United States Army as organized under section 3, act of June 4, 1920, and to provide in addition thereto a reservoir of trained officers qualified for organizing and developing to its maximum capacity the potential military power of the Nation in accordance with the approved war plans.

3. Mission of the General Service Schools: To train officers in the

(a) Strategy and tactics of large units.

(b) Functions of commanders of large units.

(c) Functions of General Staff officers serving with troops.

(d) Functions of General Staff officers serving at the War Department.

4. The foregoing may be taken as the general mission of the three General Service Schools; *i.e.*, The School of the Line. The General Staff School, and The General Staff College.

¹Originally compiled from authoritative sources for publication in the *Medico-Military Review*, Surgeon General's office.

Each of these schools has a special mission, which may be briefly stated as follows:

- (a) The School of the Line: To train officers in the
 - (1) Combined use of all arms in the division.
 - (2) Proper functions of commanders of divisions.
 - (3) Proper functions of General Staff officers of divisions.
- (b) The General Staff School: To train officers in the
 - (1) Strategy and tactics of large units.
 - (2) Functions of commanders of divisions, army corps, and armies.
 - (3) Functions of general staff officers of the higher combat units.
- (c) The General Staff College: To train officers for
 - (1) High command.
 - (2) War Department General Staff duty.

5. In the courses given at these General Service Schools features particularly emphasized are the necessity for

(1) A proper conception of the functions of the technical staff officer whose work is to be coordinated by the General Staff officer:

(2) A lucid differentiation between the functions of a commander and those of a General Staff officer.

Attendance at these schools by a medical officer materially broadens his military education. At them he acquires a sympathetic appreciation of the problems of the officer of the Line. Tritely, he gets "the other fellow's viewpoint" and learns "to speak his language." For the officer possessing the necessary qualifications the course at these schools is intended to be progressive and embrace a period of four years, viz.:

- 1 year at the School of the Line,
- 1 year at the General Staff School,
- 1 year with troops, and finally
- 1 year at the General Staff College.

AT THE SPECIAL SERVICE SCHOOLS

6. Mission of the Special Service Schools: To instruct the officers in their own branch in all the essentials necessary for a full understanding of the duties and functions required in that branch, and (in addition thereto) to give such instruction as will prepare them for the advanced training to be given in the General Service Schools.

The scope of the instruction to be given in the Special Service Schools in each branch must include the following:

(a) Basic course for all officers, as prescribed in General Orders No. 112, War Department, 1919.

(b) The technical and tactical training required for a full understand-

ing of the branch to which the officer belongs, and to include the command and staff functions of all tactical units of the branch.

(c) Such training as will qualify the officers for special duties as they may be called upon to perform.

(d) Such instruction as will prepare the student in the best practicable manner for entering the General Service Schools.

(e) In addition to the above there will be inaugurated at the various special service schools short special courses for officers of the National Guard and Organized Reserve. These short courses will be held yearly at each school and the programs will be worked out by the Chiefs of Arms and Services in conjunction with the Chief of the Militia Bureau, under the supervision of the War Plans Division and subject to the approval of the Chief of Staff.

7. Under this heading the Medical Department maintains two Special Service Schools, with various sub-divisions thereof so as to provide special instruction for members of the Medical, Dental, Veterinary, Medical Administrative Corps, Army Nurse Corps, and the enlisted personnel. The two schools are:

(a) The Medical Field Service School, Carlisle Barracks, Pa., where instruction pertains essentially to the development of the military (tactical) part of an officer's education.

(b) The Army Medical School, Washington, D. C., where instruction pertains essentially to the development of the professional (technical) part of an officer's education.

The following is a resumé of the courses now under consideration:

AT THE MEDICAL FIELD SERVICE SCHOOL, CARLISLE, PA.

(1) A basic course, to be conducted from August 1st to December 31st, for all candidates for admission to the Medical, Dental, and Veterinary Corps of the Regular Army. This course has as its object the rapid adaptation of the civilian practitioner to the life, work and customs of the Army. The instruction is progressive and extends from the school of the recruit to the organization, functions, and administration of all Medical Department units attached to the field forces or in home territory, in peace or war, such as: regimental detachments, medical regiments, evacuation hospitals, surgical hospitals, hospital trains, general hospitals, and station hospitals. The course is also designed to prepare him for the discharge of his military duties upon entry into the service, irrespective of whether his assignment be with mobile or fixed formations.

(2) An advanced course, to be conducted from May 1st to July 15th, for officers whose war or field experience indicates their fitness for advanced instruction. This course will deal mainly with the organization

function, and administration of all field units of the Medical Department. It is designed chiefly to develop commanding officers of special units and such administrative officers as army surgeons, army corps surgeons, and division surgeons. It falls under the general heading of what may be termed sanitary tactics.

(3) A special course, of from 1 month to 6 weeks duration, to be conducted at any time during the year excepting the months of June, July, and August, for such officers of the National Guard or Organized Reserves who cannot spare the time to take the full basic course mentioned in (1) above.

(4) A summer encampment course of about six weeks duration to be conducted in June and July of each year for members of R. O. T. C. Units in Medical, Dental and Veterinary schools.

AT THE ARMY MEDICAL SCHOOL, WASHINGTON, D. C.

(1) A basic course to be conducted from January 1 to June 30, for commissioned graduates of the basic course at the Medical Field Service School at Carlisle, and for selected officers of the National Guard and Organized Reserves. This course has as its object what might be characterized as a post-graduate study of the following subjects in their application to military conditions: Bacteriology, parasitology and preventive medicine, sanitary chemistry, nutritional chemistry, clinical and operative surgery, clinical medicine, ophthalmology and roentgenology. (All clinical work is given at the Walter Reed General Hospital, Takoma Park, D. C.)

(2) An advanced course to be conducted from September 1st to December 31st for selected officers who desire to do post-graduate work or to make an intensive study in any professional specialty, including any of those subjects mentioned in the preceding paragraph.

AT THE VETERINARY SCHOOL OF MEAT AND DAIRY HYGIENE AND FORAGE INSPECTION

In addition to the above, a course for veterinary officers is also conducted at the Veterinary School of Meat and Dairy Hygiene and Forage Inspection at the General Supply Depot, Chicago, Illinois. The name of the school sufficiently describes its functions. In his studies the student has access to the large stock yards and meat-packing establishments in Chicago. Two classes, comprising a limited number of selected veterinary officers and enlisted men are instructed annually. The course is of 5 months' duration and begins on January 15 and July 15 of each year. This school will eventually be administered as a branch or department of the Army Medical School. Special veterinary research work will be given at the parent school in Washington. To provide the necessary clinical facilities for veterinary officers it will become neces-

sary in the near future to establish a veterinary general hospital in a suitable locality providing a large number of animals. A divisional camp in the east will probably be selected for the establishment of this clinical school for veterinary officers.

AT THE GREAT ARMY MEDICAL CENTER, WASHINGTON

8. Plans are now under way for the establishment, as part of the Army Medical School, when it is moved to the grounds of the Walter Reed General Hospital, of a dental school a school for army nurses, a school of pharmacy, and a school for enlisted specialists. The new Army Medical Museum and Library, important links in an educational chain, will also be combined in this group.

AT HOSPITALS AND CAMPS

9. General Hospitals and the larger station hospitals, as well as division camps will also be utilized in furthering the practical education of the officer. In arranging schedules aiming at a rotation of duty or station the officer's individual preferences will be carefully considered.

AT THE MEDICAL RESEARCH LABORATORY AND SCHOOL FOR FLIGHT
SURGEONS

10. This special school is maintained at Mitchel Field, Long Island. Its object is to train special medical officers for duty at flying fields so that instruction obtained can be properly applied to lessen the risks taken by pilots. In addition to its functions as a research laboratory, considerable stress is also laid upon the training of Flight Surgeons. Primarily its aims are:

(1) To investigate all conditions which effect the physical efficiency of pilots.

(2) To institute and carry out at flying schools, or elsewhere, such experiments and tests as will determine the ability of pilots to fly in high altitudes.

(3) To carry out experiments or tests at flying schools, or elsewhere, with a view to obtaining suitable apparatus for the supplying of oxygen to pilots at high altitudes.

(4) To create a standing Medical Board for consideration of all matters relating to the physical fitness of pilots, and to train selected medical officers in the proper method of conducting such examinations.

The course of instruction at the Laboratory requires three months of intensive instruction. In addition to strictly air medical problems the students are given a thorough course in advanced work on the eye, ear, heart, nervous system and mental diseases, in order that they may be able to make the highly technical examination required of fliers by Special Regulations 65c. None of this advanced work can be obtained at any other place.

The Laboratory was equipped during the war with elaborate apparatus and appliances for research work. Among these is a large reinforced concrete chamber, the only one in this country, fitted up for the purpose of altitude studies under low temperature and low oxygen tension. The only other tank of this kind (although much smaller in size) is at Oxford, England, and this was purchased from the United States after our work at Issoudun, France, had been completed.

The work done at the Laboratory and School has been of great importance to aviation, and has resulted in the recognition of the United States as a leader in a line of work which has resulted in the saving of many lives and much property. Many discoveries of great civil and scientific importance have been made at the Laboratory. The importance of this work can be best comprehended by a close study of the book entitled "Air Service Medical," and other publications which have been prepared from information developed at this institution.

In connection with the work being done at this school, the following abstract from a recent article by Major W. L. Sheep, M. C. (*Jour. A.M.A.*, July 24, 1920) is of interest:

"The instruction given consists of lectures, demonstrations and practical work in normal physiology of respiration and circulation and in the physiology of respiration and circulation of the flier when exposed to high altitudes. The ability to differentiate the arrhythmias and all types of valvular heart disease is acquired from clinics and lectures. Methods of new and special examinations of the ophthalmologic and otologic apparatus are taught, and each student flight surgeon is required to make a number of complete examinations of the eye and the ear. In psychiatry the general field is covered by lectures and clinical work, and special attention is devoted to the making of personality studies. In psychology the instruction consists of a study of elementary psychologic methods and the psychology of aviation, a subject which has to do with the mental adaptability of the flier to the work required of him. In physics, such matters as oxygen supply apparatus, aviators' goggles, and the rebreathing apparatus for the detection of staleness and the classification of fliers, are given study and practical demonstration. The whole course of instruction requires three months of intensive work.

After its completion, and on being assigned to flying fields for duty, flight surgeons are encouraged to take flying instruction and to qualify as air pilots. They can thus by experience in the air comprehend the psychology of flying. From the study of the sensations produced during flight they gain a wealth of information of inestimable value in dealing with fliers under their charge. They have a true appreciation of the

stress which at all times the flier undergoes, the symptoms brought on by flying at high altitudes, and the physical and mental exhaustion incident to prolonged flights. They may acquire a personal knowledge of the manifestations of flying "staleness," that most insidious and dangerous ailment of fliers, which may exist when the subjects themselves are not aware of it, but which the competent observer usually detects without difficulty. Further, they have a bond in common with their fellow fliers, and it has been observed that on this account greater confidence is reposed in them by the fliers."

AT CIVIL INSTITUTIONS

11. Aside from the educational facilities afforded by the Army alone there still remains the provision whereby an officer may be placed in contact with the progress being made by the civil profession. The Army Reorganization Act of June 4, 1920, contains a clause permitting the detail of not to exceed two per cent of the commissioned officers of the Regular Army in any fiscal year, as students at such technical, professional, and other educational institutions, or as students, observers, investigators, at such industrial plants, hospitals, and other places as shall be best suited to enable such officers to acquire a knowledge of, or experience in, the specialties in which it is deemed necessary that such officers shall perfect themselves.

Under the provisions of this clause the Medical Department will be in a position to recommend the annual detail of approximately two per cent of its commissioned personnel to the leading medical, dental, and veterinary schools and other institutions of the country. Ordinarily the course of study authorized will not exceed a period of one year. In connection with this subject a change will be made in the curriculum of the Army Medical School to the end that medical officers who graduate therefrom, and subsequently desire to take a course in public health at institutions maintaining such courses, be credited with one year of work, thus enabling them to graduate with the degree of Dr. P.H. in one year, instead of the two years' residence usually required for these diplomas.

R. O. T. C. ASSIGNMENTS

12. Officers of the Medical, Dental, and Veterinary Corps are also being detailed as professors of military science and tactics in the various professional schools in which units are being established by the Army. Ordinarily such details will embrace a period of four years. An officer so detailed becomes *ipso facto* a member of the faculty of the institution to which he is accredited, and in addition to his duties as an instructor will enjoy unusual opportunities for attendance at clinics.

FOOD CONSERVATION AND THE MEDICAL OFFICER¹

BY CAPTAIN WALTER H. EDDY, S.A., N.A.

Army Sanitary School, Langres, France

THE problem of food conservation in the Army is essentially different from the civil problem. As someone has put it, our job is "to see that the food gets into the belly of the man and not in the garbage pail." A few figures will help to point the necessity for increasing attention to this Army problem.

Weight of the garrison ration . . . 4 lbs. 3 oz.

Bought in France 1 lb. 3 oz.

By ship from the United States . . 3 lbs. of actual food to say nothing of containers.

This means 3,750,000 lbs. per day, or 1,875 tons. In a year this will amount to 673,800 tons, or one 5,000-ton ship every two or three days.

<i>Potatoes</i>	<i>Per cent</i>
Refuse and waste as ordinarily peeled	25
Refuse if carefully peeled	13
Unnecessary waste	12

Ration is 1 lb. per man per day or 1,250,000 lbs. x 12 per cent = 150,000 lbs. per day or enough to feed 150,000 men.

Garbage Waste (Edible)

Should not exceed 12 per cent per day. This results in reducing the value of the ration from 4,200 to 3,696 calories per day.

These figures at least illustrate the fact that small wastes multiplied by the size of the Army are not negligible items, considered either from the viewpoint of money, transportation or nutrition.

The work of detecting waste and instituting measures for its remedy falls directly upon the medical officers of the organizations. As sanitary inspectors they are the men most cognizant with the mess conditions and it is for that reason that I wish in what follows to consider this problem in terms of the medical officer's duties and responsibilities. To illustrate the relation of the medical man to the problem let me develop one concrete example, the question of the beef component.

The ration allowance of fresh beef is 20 oz. and this component is usually issued as 70 per cent beef and 30 per cent bacon or other substitutes. This means 14 oz. of fresh beef per man per day or approximately 875,000 lbs. of fresh beef issued in quarters to the Army every day of the year as a minimum. Beef is now quoted in the United States at 22.5 cents a lb. and this little item then represents \$196,875 per day for beef alone, leaving out of consideration all cost of shipment. One per cent waste then gives us about \$2,000 a day. A little development of your imagination will suggest the significance of these amounts translated

¹Abstract from lecture.

into terms of finance, transportation, space robbed from troops, ammunition and the like.

Looked at from another angle the army ration distributes its nutrients as follows:

	<i>Protein</i>	<i>Fat</i>	<i>Carbohydrates</i>	<i>Calories</i>
	146 gms.	147 gms.	544 gms.	4,200
The beef component.....	60 gms.	60 gms.	.....	....

We certainly can not afford to waste this component either from the viewpoint of money value or as protein producer.

Now in this matter of beef conservation you play a most important part. You are the gentlemen whose judgment decides the fate of much of our frozen beef. You are charged with the health of the men and also with the prevention of useless waste of army property. It is also true in the past that large quantities of beef have been condemned by medical officers and buried or burned, a large portion of which might have been saved by careful trimming. We have ourselves, during the month of May, salvaged at Dijon 75 per cent of 35,000 lbs. of beef that had been condemned and returned to the freezer. That 26,000 lbs. of beef should have been trimmed out and issued to the troops and would have saved not only beef but valuable transportation space.

Beef is now shipped frozen from the States. At St. Nazaire it is loaded into insulated cars and travels to the nearest refreezing station, usually Gievres or Dijon. From here it is put into box cars and goes to the organizations as rapidly as possible. It is obvious that with all the delays possible in transit, the chance for partial thawing and surface decomposition is great. But the fact remains that our aim should be to see that as much of this precious material is saved and utilized as possible. That is where you come in. Remember, too, that there are no absolute tests that you can depend upon for beef condemnation and that the experience of a qualified butcher is often of much greater value in selecting the good part than the judgment of the doctor. Let me ask then that in the future when you meet such a situation you follow the procedure outlined below:

(a) First have the carcass unwrapped and then washed thoroughly with salt and water.

(b) Next, with the assistance of the best butcher you can find in the outfit go over the exposed surfaces and carefully trim off all parts that are tainted. If the covered parts seem to be affected have the covering tissue removed by the butcher, taking care not to cut into the flesh. *Do not condemn any part of the carcass until these preliminary steps have been taken!*

(c) You are now ready to examine the joints to see whether decay has started there. Do this by probe at the shoulder and hip joint. The smell on the probe will tell the story and it is not necessary to slash the quarter. If you find taint have the

butcher dissect out the bone and then trim away the meat adjacent until you reach a good layer. Remember always that the problem is to save as much good meat as possible. This sort of procedure if carefully done will usually insure a saving of from 60-70 per cent of even badly slimed beef.

(d) To prevent fly-blow make sure that fly eggs are washed off the shank immediately after the beef arrives. They will be usually found on the shank and, if left, mean extensive decomposition and waste. In fact, a safe procedure with all beef is to have the covers removed as soon as the beef comes in, have it washed with salt and water and then recovered with the cheesecloth. From that time on care will keep it sweet.

(e) The following methods are recommended for the conservation of frozen beef: Hang in an airy, well-ventilated place out of the direct rays of the sun. Meat safes covered with cheesecloth or screening to exclude the flies but allowing a free access of air will protect the beef for several days if it is wiped as often as it becomes covered with moisture. Dry mold is harmless, slime is the thing to prevent. If it is necessary to retain cut beef for more than 24 hours it may be placed in a container and covered with salt-water brine, but in cutting up beef see that the outer skin is removed if tainted before the knife cuts the flesh. A piece of tainted skin carried into the meat will taint the whole batch.

Nobody wishes tainted meat used for food, but that does not necessitate wholesale condemnation.

Your work in beef conservation, however, does not stop here. It is equally important to see that every part of the carcass is used to its maximum nutritional efficiency. The stock pot is an instrument of conservation and also provides material for both soups and gravies. There is no excuse for green bones in the garbage can.

I have used the above as one example of how you as medical officers are most important conservation agents. Let me develop other phases of this particular function of yours. Beef in the form of slum, day after day, means both dissatisfaction and waste. Man likes variety in his diet. If he doesn't get it he soon loses appetite and the garbage can gets the food that should nourish him. That idea calls attention to the need for continual inspection of menus. Line officers know little of balanced diets. They depend upon your criticism to cover that point in the feeding of the men. Furthermore, it is a very easy matter to include in your mess inspections a glance from time to time at the posted menu. That, of course, means that there must be such a thing as a posted menu and you should insist on finding them. Failure to find one usually means that the cooks and mess sergeants are giving very little attention to variety. You can't vary the garrison ration without giving that attention, and the menu is the key to the situation. Please make that a part of your inspection, and as prophylaxis against nutritional disturbances and lowered morale it will repay the effort.

A second big feature of our ration is bread. The American Army is now the only collection of individuals in the world who are allowed to

eat white bread. Your wife and mine can't get it. Every one in the United States is straining to save wheat for our use. They are paying 10 cents a pound for Victory bread in New York City today. Before the war wheat averaged about \$1.00 a bushel. It is now worth \$2.18. Since the war began our exports to England have increased 170 per cent, to France 364 per cent, to Italy 330 per cent. We are literally supplying the world with wheat, and at great sacrifice to our families. That should at least make it imperative for us to exercise the greatest care in conserving the supply. There are two sides of this problem where you can be effective.

First: In the utilization by the mess. Watch the garbage can and the bread box. If bread appears in the former it is a matter for drastic action. See that slices are cut thinner or halved and that men take only what they can eat. See that scraps are utilized as bread pudding, as bases for desserts, as croutons for soup. There are many ways of getting full value of the bread ration and no excuse for its wastage.

Second: There has recently been considerable trouble with bread mold. Its cause is even yet uncertain but we hope the solution is in sight. You can, however, help in the matter. On the bottom of each loaf shipped will be found a paper paster giving the date the bread was baked and the number of the company that baked it. These data are significant. Don't take hearsay on mold hereafter. Require the loaf produced. Note the date. Learn from your railhead officer how long it should take to get bread to the outfit. If the date on the loaf indicates it has been abnormally long in the unit, locate the trouble there. Find out the conditions under which it is stored in the mess. In brief, first make sure that the trouble is not in the organization. If sure all on these points, notify us, giving date and bakery company number. We have then got something to work on and do not need to make a long trip to learn facts readily available to you. General complaints mean nothing: facts we can act upon.

I have referred before to the value of the garbage pail as a means of diagnosis of mess inefficiency. Another source of information is the mess storeroom. And right here let me interpolate a word as to mess inspection generally. I have seen too many messes that have been O. K'd by the sanitary inspector that were models of cleanliness and absolutely inefficient as purveyors of food to hungry men. When you inspect a rifle your aim is to see that it is in condition to shoot, to function. The functioning of a kitchen is what we are most concerned about and unless your inspection insures *tha'* the other features are relatively unimportant. I realize that you are not mess officers but you are

directly concerned with the health and nutrition of the men and responsible for it. That, I think, justifies the following suggestions.

I have already illustrated in the case of the meat and the bread the way in which the garbage can serves as an indicator of waste. Let me consider a typical case in which the storeroom serves the same purpose. One often finds in the storehouses an accumulation of sugar. You will usually find such messes complaining of lack of sufficient bread. The reason is not immediately obvious. The sugar allowance is ample to provide for the making of desserts and the garrison ration provides materials for over 30 of such desserts if the cooks will take the trouble to study their Cook's Manuals and work them up. If these desserts are not made the men crave sweets and the nearest substitute is bread. Try to eat a heavy meat and vegetable meal without a dessert to top it and you will find yourself reaching for the bread to offset the cloying effect of the excess in the other direction. Given a dessert this need is satisfied. This example is only one of many. An accumulation of any ration article in the storehouse has a meaning that, translated into nutritional needs, is indicative of some defect in mess management. A little study will reveal these and help greatly in making your kitchen more effective.

Take another example of another sort. Accumulation of lard in the mess room storerooms under the present ration issue should indicate a defect of the ration and in fact is really complimentary to the cook. The reason lies in the fact that the meat ration supplies so great an amount of fat that if this is properly rendered it is sufficient for practically all cooking needs. In that case the lard component is too large. Now that fact is actually established and steps have been taken to reduce the lard allowance 50 per cent and increase milk and fruit 100 per cent. These changes will go into effect soon. But unless the matter is carefully checked your units will run out of cooking fat, as soon as this change goes into effect. The fat must be saved to permit the change and by reducing the space taken by the lard we are enabled to increase the bulk of other foods desired without increased shipping space.

This whole question of fat saving in fact assumes very important proportions. The Salvage Department has arranged to receive all excess fat and to pay the units for it. There are hosts of messes in the A. E. F. where the installation of a simple grease trap would not only help to keep the dishwater from polluting the ground but will yield an appreciable amount of fat for salvage. A little interest in this feature will go far to realize an appreciable saving of this substance for glycerine and ammunition. We are the only Army that has not taken active measures to secure the conservation of this by-product. In England the cooks'

salaries are determined in part by their efforts in this fat-saving effort. In our Army we have seen the excess lard used to kindle a green wood fire. Such things are criminal!

Without enlarging on this point further I think you will grant that it is worth while for the medical officer to make a careful study of these two diagnostic agencies, the storeroom and the garbage pail, and to develop their significance as indices of mess conditions.

Another field that I wish to call your attention to is that of necessity for study of the ration as issued. It is a deplorable fact that very few mess sergeants and cooks have an accurate knowledge of what the ration is. The next time you make your sanitary round ask each mess sergeant how much beef his men are entitled to each day. You will, I think, be greatly surprised to learn how few are informed on this essential subject. The reason is not far to seek. Until the troops reached France the ration was simply a system of accounting. The ration savings principle had made the sergeant and cook more or less adept at using the ration allowance to obtain variety and build a mess fund. Arrived here the savings principle stopped, the ration was issued in kind, the sergeant and cook got the idea that their job was to take what was given them by the supply officer and do the best they could with it. They took no trouble to learn what they had a right to demand. As a result there is an appalling ignorance of what the ration as issued entitles them to. There are very serious consequences arising from this state of affairs and you can help to remedy it. Will you not see to it that every mess sergeant in your future commands not only knows what ration he is entitled to but also exactly how it is issued. Unless he does his judgments as to the special requirements of his men are absolutely unreliable. I recently investigated a demand for increased ration on the part of a labor troop where the statement was made that more food of a certain sort was needed and that the meat ration could be cut 40 per cent. Investigation showed that the meat ration had, through ignorance, been overdrawn that month some 40 per cent. Such a condition made it absolutely impossible to tell whether the ration was adequate or not.

There is nothing sacred about the ration. It can be changed as needed. It has already been changed in France and a new set of changes will be issued soon. But at present it supplies nearly 4,200 calories. It is capable of very great variety of menu-making to the careful student of its components. You will be asked frequently to pass on requests for changes to meet the needs of particular troops. Please consider these requests food for careful digestion and not for snap judgment.

Study the organization. Before recommendation satisfy yourself on the following points:

- (a) Is the organization getting its full ration allowance?
- (b) Is the ration getting into the men and not into the garbage can?
- (c) Is the dissatisfaction due to actual hunger or to failure in menu-making and cooking?

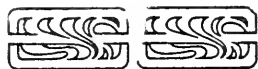
If these conditions are satisfactorily complied with, you have a case, and quick action can be taken thereon.

I have dwelt today on a few of the phases of food conservation in the Army that affect the medical officer. They are intended to be suggestive rather than exhaustive of the subject. Venereal inspection and clean dishes are only a small part of the duty of a sanitary inspector who covers mess conditions, and an active interest in his part in the conditions that make for good messing will go far to relieve the troubles occasioned by green cooks, inefficient mess sergeants and uninformed line officers. The care of the sick is important, but in that care you are looking after the liabilities of an army. There is no way in which you can do more effective work in winning battles than in caring for the assets of the Army, its fighting forces. At the same time you will be actually seeing to it that the food so carefully saved at home by the sacrifices of our families goes where it was intended to go, to win the war.

Followed a brief outline of the duties of the Food and Nutrition Section of the Chief Surgeon's Office and the method in which it might serve to assist the medical officer in his work.

NOTE.—Evaporated potatoes should be soaked till they swell up to nearly their normal size. The time necessary varies with the kind of potato and the character of the water. Tin vessels should not be used for soaking as they are apt to turn the potatoes dark. They are best served as a mashed or creamed potato.

NOTE.—The General Orders referring to rations are as follows: G. O. 1917: 18, 38, 67, 78. G. O. 1918: 19, 44, 54, 70.



SUCCESS OF THE CAMPAIGN FOR COMBATING VENEREAL DISEASE IN THE A. E. F.¹

BY LIEUTENANT COLONEL HUGH H. YOUNG²

Medical Reserve Corps, United States Army

THE campaign against venereal disease in the A. E. F. consists briefly of the following:

1. *Social Hygiene*.—for the purpose of minimizing the number of sexual contacts.

2. *Prophylactic Treatment*,—to prevent the development of venereal disease after sexual contact.

3. *Physical Inspection of Troops*,—to detect venereal disease with the object of instituting prompt and efficient treatment in order to reduce the number of days sick; and of restricting leave in order to combat the spread of infection.

4. *Repression of Prostitution*.

5. *The Reporting of Sources of Infection* and Dispensary Treatment of Civil Population.

6. *Enforcement of Laws Relating to Alcoholism*.

7. *Court Martial for Venereal Disease*.

8. *Treatment of Venereal Disease with the Organizations*—in order to reduce the loss of effective strength and to avoid making venereal disease an excuse for escaping duty.

Major Keyes has spoken at length of the method of social hygiene and the efforts to combat and repress prostitution which have been adopted in the A. E. F. I will therefore confine myself to other phases of the problem.

The forceful General Orders 6, 34 and 77 A. E. F., 1917, have furnished the basis for a very active and radical campaign.

The wonderful laws passed by Congress for the protection and enlightenment of our troops in America have been considerably supplemented by very vigorous and far-reaching orders here.

G. O. 6, 1917, A. E. F., requiring that *all* men with venereal disease be tried by court martial and punished by loss of pay has largely put an end to efforts to thus escape punishment by falsifications on the prophylactic records.

One of the first General Orders which were issued very soon after arriving in France (G. O. 6) dealt with the frequency and danger of venereal diseases, and dwelt upon the responsibility of Company Com-

¹Lecture delivered at The Army Sanitary School, Army Schools, American Expeditionary Forces, 1918.

²Director of Urology.

manders and Medical Officers towards their men. The intense interest displayed in the physical condition, health and morals of his men by the Commander-in-Chief in this and subsequent general orders has had a wonderful effect in creating a fine *esprit de corps*. Organizations now take pride in declaring that "we have a clean bunch here."

The radical provision requiring that all men contracting venereal disease be court-martialed and punished by loss of pay—which punishment had often been avoided by taking prophylaxis after the disease had started and getting name on register—has not only done away with the reason for this deception, but has forced the men to abstain or make every effort to prevent disease by taking early prophylaxis to escape punishment.

G. O. 34 which again urged sexual continence and high moral standards of living, and required that men arriving in Paris and other cities have papers vised, be given warning as to the danger and prevalence of venereal disease, and be required to reside in barracks or hotels designated by the Provost Marshal where prophylaxis stations have been organized, has had a splendid effect in the prevention of debauchery and venereal disease.

The provisions of G. O. 34 promulgating a plan for treatment of venereal patients without evacuation to hospitals, but at dispensaries where they would remain on duty status, continuing at work or drill, has had a wonderful effect in preventing loss of effectives and in doing away with the voluntary acquiring of venereal disease to avoid military service as has often happened in other armies. At the same time, the possibility of early radical and consecutive intravenous treatment has been secured for the first time in any army in the field.

As a result, instead of now filling three one-thousand bed hospitals with venereal patients as had been expected by this time and planned for in the U. S., there are no venereal hospitals, and only about three hundred beds occupied by venereal cases, and these largely in regimental and field infirmaries.

G. O. 77 which dealt radically with base ports, prohibiting shore leave to soldiers still on transports, restricting soldiers to camps, placing the saloons and houses of prostitution out of bounds, and again directing officers to assist in making venereal prophylaxis effective has had a really marvellous effect. A previously riotous seaport city has been transformed; drunkenness there has almost disappeared, licentiousness has been rudely curbed and the venereal infections have been reduced to a minimum.

The order requiring that the venereal status of an organization be filed at G. H. Q. with the personal records of the Commander to be

"Used as a basis in determining the Commander's efficiency and the suitability of his continuing in command" has been of immense value in awakening a sense of responsibility in the health and hygiene and effectiveness of the troops of his command. This is one of the most powerful army sanitary orders ever issued.

SEXUAL CONTINENCE

In various general orders and circulars sexual continence is urged to the troops of the American Expeditionary Forces. Is this in any way possible in armies? There are many who scoff at the idea, and consider that it is out of the question to expect it among soldiers. What do our statistics show in this regard? It is, of course, impossible to get accurate statistics upon these delicate subjects. Even well-disciplined soldiers, although ordered to take venereal prophylaxis after each sexual intercourse are not infallible on obeying these orders, but we believe that the great efforts which have been made in the A. E. F. to make troops realize the danger of venereal disease has had the effect of making the great majority take venereal prophylaxis after sexual indulgence. Where prophylaxis is not taken the venereal rate becomes high. We may, therefore, utilize the statistics of the prophylactic stations as indicating in a fair way the amount of sexual congress among the various organizations. The following table taken from the troops of one Division who had been about seven weeks in France, is exhibited as an argument for the possibility of having almost complete sexual continence among fairly large numbers of soldiers.

TABLE 1.

<i>Organization</i>	<i>Strength</i>	<i>Time in France</i>	<i>Venereal Prophylaxis Taken</i>	<i>Venereal Disease Acquired</i>
Ambulance Company.....	155	6 weeks	0	0
Headquarter troops.....	330	4 weeks	0	0
M. C. O.....	582	6 weeks	0	0
Battalion Infantry.....	1,367	8 weeks	6	0
Ambulance Company.....	122	6 weeks	2	0
Ambulance Company.....	123	8 weeks	0	0
Engineers.....	515	8 weeks	16	0
M. C. C.....	570	8 weeks	17	0
Signal Company.....	270	8 weeks	4	1
Regiment Infantry.....	3,267	8 weeks	11	0
Totals.....	7,401	av. 7 weeks	56	1

Analyzing this chart, we see that in one infantry battalion of 1,367 men who were eight weeks in France, only six prophylactic treatments were taken. The fact that four careful inspections failed to reveal any venereal disease is given as evidence that the prophylactic records are probably fairly correct. Three venereal cases which are present were with the organization on arrival in France.

Another notable case is that of an infantry regiment—the last on the

list—3,267 men which had been two months in France, during which time only 11 prophylactic treatments were taken and no venereal disease acquired. Sixteen cases of venereal disease, all old cases present when the regiment landed in France, was the sum total of venereal disease in the regiment, a venereal rate of 5 per 1,000 or one-half of one per cent. The total number of men in this table was 7,401; the average length of stay in France 7 weeks; the total number of venereal prophylaxes 56. Among these 7,000 men, during a period of almost two months, only one new case of venereal disease was discovered after four careful physical examinations were made. This record, of course, is remarkably good—probably better than the Army as a whole, but these organizations are cited as evidence that sexual continence can be followed by large bodies of troops for a considerable period of time.

This has, however, already been demonstrated by the French and British Armies, whose troops have remained for long periods (varying from four to twelve months) at the front where there are no women, and where sexual continence is the rule per force of circumstances. No one has ever suggested that these troops were not in fine fighting trim, or that their morale had been diminished by their excellent morals. One of the best preparations for the zone of the front in which troops have to follow enforced continence, is to have troops in training, habituated to getting along without sexual indulgences. This long drawn-out war of the trenches has exploded another old-time fallacy, *i.e.*, that the soldier must be a libertine in order to be a fighter.

EFFICACY OF PROPHYLAXIS

The Army statistics for sixteen years have effectively demonstrated the wonderful results which can be obtained by prophylactic treatment in preventing venereal disease. One of the most careful studies on the subject is that contained in a recent report by Riggs, from which the following table is taken:

TABLE 2.—*Number of Prophylactic Treatments, Failures and Percentages for Each Hour After Exposure.*

<i>Hours subsequent to exposure</i>	<i>Number of treatments</i>	<i>Number of infections</i>	<i>Per cent of infections</i>
1	1,180	1	0.08
2	1,172	7	0.59
3	521	4	0.77
4	330	2	0.61
5	199	3	1.57
6	321	5	1.58
7	277	6	2.27
8	390	16	4.22
9	283	10	3.62
10	214	11	5.14
More than 10	216	16	7.40
Totals.....	5,103	81	1.58

There were 1,180 treatments during the first hour which were followed by a single infection. This infection was carefully investigated and there is considerable doubt as to whether it was genuine or not. The disease was diagnosed as chancroid, and was cured in two days.

There are no statistics from which we may deduce the normal percentage of venereal infections that may be expected to follow illicit sexual intercourse when prophylactic means are not employed. In the above table, those who took prophylactic treatment later than ten hours after exposure give a rate of infections of 7.4 per cent and applying this percentage to the 6,746 recorded exposures gives an expectancy of 499 venereal infections. As a matter of fact, there were only 127 subsequent infections, so it may be assumed that the difference, 372, represents the least number of venereal infections which were prevented by the 6,746 treatments. It is unlikely that the venereal situation in this community would have been better had the 6,746 prophylactic treatments been withheld, and these 372 venereal infections been permitted to take place.

Study of the medical records of the A. E. F. amply testifies to the accuracy of these assertions.

In one of the base areas over a period of three months, among troops varying from 7,272 to 16,301, 9,129 venereal prophylaxes were given (about one to every four men per month, but many offenders were each responsible for several V. P. so that the actual number of men having intercourse was much less than 1 in 4). Among these troops there were during this period 374 venereal diseases discovered at the biweekly inspections. In 144 of these no venereal prophylaxis had been taken, leaving 230 cases of venereal disease in which the prophylactic treatment had been used, showing failures in 2.5 per cent. Many of these troops were grouped in small units in which medical organization and supervision was difficult, so that the records are not as good as those obtained elsewhere.

The record of 8,000 troops, a part of one of the divisions which arrived during the summer at one of the ports in France and proceeded, after a short stay, to one of the training areas in eastern France in which there were numerous villages, with a fairly large population, among which they were billeted, showed that there had been 2,363 venereal prophylaxes taken at the port of debarkation (where houses of prostitution then flourished) and 130 in the training camp. During the month these troops had been in France 28 cases of gonorrhoea, 8 cases of chancroid and no case of syphilis had developed. My records do not show how many of these men with venereal disease had taken prophylactic treatment, but it is fair to assume that the majority had not taken it; but even if all are reckoned as failures of venereal prophylaxis to prevent disease, the percentage of failure for the 2,493 prophylaxes taken would be 1.4 per cent. The following chart, in which accurate records have been kept, shows what can be obtained by prophylactic treatment even when the number of sexual contacts is considerable.

TABLE 3.

<i>Organization</i>	<i>Strength</i>	<i>Prophylaxes Taken</i>	<i>Venereal disease cases</i>	<i>Failure of Prophylaxis Per cent</i>
Engineers.....	987	1,328	20	1.5
Field Artillery.....	855	248	6	1.4
Engineers.....	982	545	9	1.6
Field Artillery.....	834	283	3	1.0
Base Hospital.....	213	274	2	0.7
Totals.....	3,995	2,727	36	1.4

The general prophylactic efficiency rate of 1.4 per cent is good, but indicates that an average of 4 hours elapsed according to Rigg's table. The last unit with a rate of 0.7 per cent shows what ought to be accomplished with prophylaxis.

The following records from some of the smaller organizations are of interest:

One battalion of—Infantry at seaport base for two months on police duty, during which time ample chance for sexual congress was present, as shown by 392 venereal prophylaxes taken, had only two new cases of venereal disease during this time.

A Headquarters Troop with strength now 460, in France six months, had in its personnel only one new case of venereal disease, and in this no venereal prophylaxis had been taken. In fourteen units with a personnel of from 150 to 200 each and totalling about 2,500 men, there were in the month of February only 4 cases of venereal disease (and confined to three of these units in which 216 prophylactic treatments had been given (1.8 per cent failure). In the other eleven units 572 prophylaxes were given and there were no infections. Four Base Hospital units, with an average personnel of 200, had in six months, no venereal disease.

Among the troops in the field the rate per 100,000 men was 1502 prophylaxes and 66 cases of venereal disease, showing a failure in about 4 per cent of the cases. These troops were frequently on the move, and often remained for a day or two in small towns or cities where it was difficult or impossible to arrange prophylactic treatment and in which abundant chance for intercourse was at hand. This accounts for the higher percentage of failures.

In September, 1917, before the propaganda against venereal disease and methods of prophylaxis and treatment had been thoroughly organized, the monthly rate of new cases was 4.2 per thousand, whereas in January, 1918, the monthly venereal rate had dropped to 2.5 per thousand, and in March to 2 per thousand—certainly a splendid record for the American Expeditionary Forces.

The relation between high venereal rate and the failure to take prophyl-

lactic treatment is very definitely shown by many of our records. Thus in two artillery regiments with a strength of about 250 men, and with the same number of prophylaxes taken during a given period, the venereal rate in one was 79 and in the other 25, as shown in the following chart:

Organi- zation	Strength	No. of V.P.	Aver. per man	VD after V.P.	Failure Per cent	V.D. & Total V.P.	No.	Rate per 1,000
X.....	855	478	0.56	7	1.4	7 14		70
Y.....	834	450	0.52	5	1.0	0 5		25

As will be noticed here, the average venereal prophylaxes taken *per man* were about the same—0.5 but in the first it was not so successful, 1.4 per cent as compared to 1 per cent, but the principal difference arose from the fact that in the first regiment there were 7 cases of venereal disease in which no prophylaxis had been taken, and in the other no cases of venereal disease from failure to take prophylaxis, thus making the total venereal disease in one regiment 14 and the other 5, and the venereal rate 70 per thousand in one and in the other 25 per thousand for the whole year—a remarkably low rate.

The table given below is of two organizations of nearly equal strength—one well regulated, the other a motor-truck company “running wild.” The period is for three and one-half months.

Organi- zation	Strength	No. of V.P.	Aver. per man	V.D. after V.P.	Failure of V.P. per cent	V.D. and No. V.P.	Total V.D.	Annual rate per 1,000
A.....	212	240	1.1	2.0	0.8	1.0	3	50
B.....	206	350	1.7	12.0	4.0	2.0	14	328

In organization “B” the V. P. taken were 40 per cent greater and the failures five times as great. There were also twice as many cases of V. D. in which no prophylaxes had been taken, and together they gave the startling difference in annual rate per 10,000.

Inquiry showed that in B the prophylaxes were taken much later than with A.

In two infantry battalions a tremendous difference in the V. D. rate was caused by the fact that one commander gave frequent all-night leaves—the men taking their prophylaxes on return next day. The rate was three times as great as in the other in which men were required to be back at night.

Another comparison which brings out the fact that the venereal rate is proportional to sexual contacts is shown in the records of the two organizations given below. In both of these the venereal prophylaxis was about equally successful (1.6 per cent and 1.4 per cent).

<i>Organi- zation</i>	<i>Strength</i>	<i>V.P.</i>	<i>Aver. per man</i>	<i>V. D. after V.P.</i>	<i>Failure of V.P. per cent</i>	<i>V.D. and No. V.P.</i>	<i>Total V.D.</i>	<i>Rate per 1,000</i>
Eng.	982	559	0.6	9.0	1.6	3	12	49
Eng.	987	1,494	1.5	22.0	1.4	6	28	109

The number of men in each organization is seen to be about the same, but the average coitus per man as shown by the prophylaxes taken was almost three times as great in one organization, and the venereal rate was also nearly three times as great. These figures show conclusively that even if the venereal prophylactic methods are wonderfully successful and only fail in a small percentage of the cases (1.5 per cent) it is extremely important to bend every effort to minimize the amount of sexual contacts, and thus reduce the possibility of infections. Our statistics prove conclusively that this is accomplished best by putting the houses of prostitution out of bounds, and thus reducing the facilities for obtaining sexual intercourse among the soldiers, as shown by the following record from a base front.

TABLE 4.

<i>Whites</i>	<i>Month</i>	<i>Strength</i>	<i>V.P.</i>	<i>Per cent per man</i>	<i>V.D. Cases</i>	<i>V.D. rate per 1,000</i>	
Houses open to soldiers	{ Aug.	4,571	1,669	43	72	16	} V.P. not taken early; rate high.
	{ Sept.	9,471	3,392	36	124	13	
	{ Oct.	3,966	2,074	52	67	16	
Houses out of bounds.	{ Nov.	7,107	885	12	81	10	} First half of Nov. not closed.
	{ Dec.	4,281	539	12	44	10	
	{ Jan.	3,777	523	13	8	2	
<i>Negroes</i>							
Houses open.	{ Aug.	430	14	3	20	19	} It was difficult to get negroes to take V.P.
	{ Sept.	411	.....	.....	21	51
	{ Oct.	607	91	15	66	109	
Houses out of bounds.	{ Nov.	1,807	398	22	142	103	} First half of Nov. not closed.
	{ Dec.	2,830	111	4	59	21	
	{ Jan.	5,613	289	5	62	11	

During the months of August, September, October and first half of November, the houses of prostitution flourished and were filled with soldiers. On November 15 rigid orders were issued placing these houses out of bounds, and the immediate results were great reduction in the number of sexual contacts, as shown by the number of venereal prophylaxes taken. As a result there was a steady decline in venereal infections, and the monthly rate per thousand, which in October reached 16.8 dropped January to 2.1 among the white troops. During the same period there was an even more startling drop in the venereal infections among the negro laborers, the percentage dropping from 108.7 per

thousand per month to 11 per thousand. No statistics could speak more eloquently for the doctrine of closing the houses of prostitution. Our studies showed numerous infections coming from houses "inspected" three times a week.

A recent report by a consulting urologist is also of interest. "I have noticed in the base sections that very few of the enlisted men can speak French, and many of them for this reason refrain from speaking to a girl on the street, and if they do, many even then are afraid to go to a strange place with her on account of lack of a clear understanding. These soldiers, on the other hand, find no difficulty in going to a house of prostitution where an interpreter is always at hand, and where little talking is necessary. The houses of prostitution are prepared to do a wholesale business in sexual commerce, while the clandestine prostitute must of necessity be restricted in the amount she can accomplish in a given time. As an example, I cite the instance of the 60 prostitutes in houses at ——having had during ten days in September 15,000 sex relations." With every facility afforded for obtaining sexual intercourse even though the venereal prophylaxes are always taken, and the rate of failure of prophylaxis is small if the number of sexual contacts greatly increases, the venereal rate must of necessity also gradually increase. The necessity, therefore, of restricting sexual contacts is self-evident, and the need of putting the houses of prostitution out of bounds is imperative.

VENEREAL PROPHYLAXIS STATIONS

The following report from a urologist concerning one of the venereal prophylactic stations located in a city of about 100,000 population is given. In this city, during one month, 799 prophylactic treatments were given American soldiers. These men were carefully questioned, and it was found that of the 799 men, 761 had been to houses of prostitution and 33 had been with clandestine prostitutes. In the case of 5 no record was obtained. In the same city, a study of the venereal cases during two months—27 cases of venereal disease in acute stages—showed the following sources of infection: U. S. 9, Paris 1, Bescancon 1, St. Nazaire 1, a total of 12 cases which had not been acquired in the city. Nineteen of the twenty-seven patients had received no prophylactic treatment. Only three claimed to have received the treatment within three hours. There was a marked variation in patronage at the prophylactic stations according to the days of the week. On Monday, Tuesday, Wednesday, Thursday and Friday of each week, there were very few prophylaxes given. On Saturday the number increased, but by far the greater number were given on Sunday.

Records of the Paris Venereal Dispensary.

	<i>Per cent.</i>
From April 1 to 20, V. D. cases.....	42
Number of V. P. taken among these.....	25
V. P. administered to self.....	2
Uncertain (records elsewhere).....	9
V. P. after all night.....	2
V. P. in three hours.....	1
V. P. in two hours.....	2
Analysis, failure after three hours or less.....	4
Total number of treatments given.....	785
Per cent of failure of V. P.....	0.5

The great cause of venereal infection has been the baneful effects of houses of prostitution, and unbridled street solicitation, which are responsible for most of the contacts, and the failure to take prophylaxis early. Efforts now being made to enforce the wise and comprehensive provisions of G. O. 6, 34 and 77 are bearing fruit splendidly.

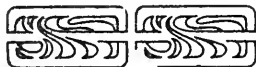
Those organizations which have a high venereal rate generally have inefficient line and medical officers. It is hoped that the three provisions of G. O. 77 will bring them to book.

The following comparison between the U. S. Army in 1916 and the A. E. F. in 1918 from the report of April 8, 1918, is as follows:

The U. S. Army 1916 venereal non-effective rate per 1,000 was 5.62, while in the A. E. F. it was 2.13.

The venereal rate just reported for last week is even better, being exactly 2 per thousand.

The figures speak for themselves, and no arguments are necessary to show the splendid record of the A. E. F., and the efficiency of the extensive program which is being carried out to combat venereal disease, in which General Pershing and General Bradley have taken such great interest.



THE WATER SOLUBLE B VITAMINE CONTENT OF CERTAIN VEGETABLES*

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(With eight illustrations)

IN THE studies of the effect of the water soluble B vitamine upon the growth of young animals many attempts have been made to determine the comparative amounts of this vitamine present in the different food products.

No method is available which will isolate the vitamine as a chemical compound in quantities that can be measured.

Williams¹ and Bachmann² advocate the utilization of the vitamine requirement of yeast in the quantitative study of the water soluble B vitamine. In this method when a synthetic media is inoculated with yeast no multiplication of the yeast cells occurs¹ nor does the formation of gas² take place unless another factor, present in certain substances of animal and vegetable origin, is added to the media. Both Williams and Bachmann believed that this yeast growth-promoting stimulus was the water soluble B vitamine. This view was later supported by Eddy and Stevenson,³ while Emmett and Stockholm⁴ reported that the amount of the yeast growth stimulus did not appear to vary directly (in terms of potency) with the amount of the water soluble B vitamine present. The conflicting reports upon the accuracy of this method tend to detract from its value at the present time.

In general, the quantitative studies that have been made of the water soluble B vitamine have been based upon feeding experiments on birds and animals. The work of McCollum and co-workers^{5,6,7} and that of Osborne and Mendel^{8,9} afford typical examples of these observations.

That part of the work which has had for its object the demonstration of the growth-promoting power of the water soluble B vitamine has usually been done by feeding experiments performed upon young albino rats. In this type of experiment the rat is given a purified basal

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¹ Williams, R. J., *Jour. Biol. Chem.*, 1919, xxxviii, 465.

² Bachmann, F. M., *Jour. Biol. Chem.*, 1919, xxxix, 235.

³ Eddy, W. H. and Stevenson, H. C., *Jour. Biol. Chem.*, 1920, xliii, 295.

⁴ Emmett, A. D. and Stockholm, M., *Jour. Biol. Chem.*, 1920, xliii, 287.

⁵ McCollum, E. V. and Simmonds, N., *Jour. Biol. Chem.*, 1918, xxxviii, 55.

⁶ McCollum, E. V. and Davis, M., *Jour. Biol. Chem.*, 1915, xxiii, 247.

⁷ McCollum, E. V., Simmonds, N. and Pitz, W., *Jour. Biol. Chem.*, 1917, xxix, 521.

⁸ Osborne, T. B. and Mendel, L. B., *Jour. Biol. Chem.*, 1920, xli, 451.

⁹ Osborne, T. B., and Mendel, L. B., *Jour. Biol. Chem.*, 1919, xxxvii, 187.

ration, which is a satisfactory growth-promoting diet except for the absence of the water soluble B vitamine. The missing factor is supplied in the form of a dried and powdered food product, or the extract of a food product. This vitamine-bearing substance may be fed to the rat in a separate feeding device,⁸ or it may be intimately mixed with the basal ration.

In so far as the quantitative study of the water soluble B vitamine content of a food product is concerned in the feeding experiments, it has been the practice to base the calculations upon the amount of the vitamine-bearing substance necessary to maintain a normal rate of growth, or to restore the animal to a normal condition after the weight has declined on a diet devoid of any substance containing the vitamine. When a known amount of the vitamine-bearing food substance has been incorporated in the basal diet, the amount of such substance eaten by the rat is expressed in terms of percentage of the total food intake. When fed separately the results are based upon the weight of the vitamine-bearing substance consumed by the animal.

Several factors enter into and tend to confuse the results obtained from the feeding experiments that utilize as a unit of measure that amount of the vitamine-bearing food product that is necessary to maintain a normal rate of growth in the animal, or the amount necessary to restore it to a normal condition after a decline in weight has taken place on a vitamine-free diet.

It is very difficult to determine just what constitutes a normal rate of growth for an individual animal. When an animal is receiving a sufficient amount of the growth-promoting vitamine a normal rate of growth takes place, but should an excess of the vitamine be given, no increase in the rate of growth occurs. If, after an excess of the vitamine-bearing food product has been fed for a time, the vitamine is removed from the diet, a more or less normal rate of growth continues for from one or two days to two or three weeks (see chart No. 8), indicating that a storage of the vitamine within the body tissues has occurred. Muckenfuss¹⁰ has shown that when an excess of the vitamine is present in the diet small quantities are eliminated in the urine and bile. To obtain accurate results by this method it is, therefore, necessary to feed the animal at all times just enough of the vitamine-bearing food product to maintain a rate of growth which has been decided to be the normal rate for that animal. If an excess above this amount is fed, the rate of growth gives no indication that such an excess is being received. If the amount of the food product is reduced, then the vitamine which has been stored in the body while an excess was being received will

¹⁰ Muckenfuss, A. M., *Jour. Am. Chem. Soc.*, 1918, xl, 1606.

maintain the rate of growth for a time. If, however, the vitamine in the diet is entirely removed, or reduced to such an extent that a decrease in the weight occurs, then after this decline in weight has taken place there are times when an excessive amount of the vitamine-bearing substance is necessary to restore growth (see chart No 8).

It is evident that at any one time during the growth of the animal a certain portion of the growth-promoting vitamine is utilized by the body to maintain its weight at that particular point. Any of the vitamine that may be present, in addition to the maintenance requirement, is used to promote further growth. If the amount of the vitamine received by the animal falls below the maintenance requirement, the weight will be reduced until the amount of the vitamine is sufficient for maintenance, or death takes place.

In order to avoid the sources of error encountered when the rate of growth is used as an indication of the amount of the water soluble B vitamine that is present in a food product, the maintenance requirement has been utilized in this study to determine the comparative amounts of this vitamine present in different vegetable food products.

Young albino rats were selected at the age of from four to five weeks and each rat was placed in a separate compartment. This compartment, together with the feed boxes and water bottles, was composed entirely of metal or glass and no bedding was used, so that there was no foreign material for the rat to gnaw.

The rats were then placed upon a purified basal ration consisting of:

	<i>Per Cent</i>
Casein.....	20
Starch.....	61
Butter fat.....	15
Salt mixture ¹¹	4

The butter fat was obtained by melting butter at the lowest possible temperature, allowing the water, curd and salt to settle out and decanting off the butter fat. This ration has proven satisfactory for growth except for the absence of the water soluble B vitamine.

The rats were kept upon this ration until growth had ceased and in some cases until a slight decrease in weight had occurred.

The vegetable to be tested for its water soluble B vitamine content was fed to the rat, in addition to the basal ration, in such quantities that a slow but steady increase in weight took place. The daily allowance of the vitamine-bearing vegetable was gradually decreased until the weight became constant at some point between 75 and 100 grams when the rat had reached an age of 100 to 130 days. Beginning with

¹¹ Osborne, T. B., and Mendel, L. B., *Jour. Biol. Chem.*, 1917, xxxii, 317.

the age of the rat somewhere between 100 and 130 days and the weight between 75 and 100 grams, this weight must then remain constant, with an allowable variation of 4 per cent plus or minus, for a period of 30 days, during which time the rat receives daily a fixed amount of the vegetable being tested for its vitamine content. At the end of the thirty-day period a rate of growth, which is approximately equal to that of a normal rat, must be immediately restored when the vegetable food product is replaced by 500 milligrams of dried yeast, which is known to contain a comparatively large amount of the water soluble B vitamine. The immediate restoration of growth indicates that the lack of growth had been due to a diet deficient in this growth-promoting vitamine.

The vegetable food products tested in this experiment for their water soluble B-vitamine content were fed either in the raw or cooked state. The cooked vegetables, with the exception of the baked potato, were prepared by boiling until tender and then the cooking water was drained off. In testing the cooked vegetables it was not the object to ascertain the effect of the heat alone upon the vitamine, but to determine the effect which the whole process of cooking may have upon the removal of the water soluble B vitamine. In boiled vegetables this includes the effect of a boiling temperature, for a period of time sufficient to render the particular vegetable edible, the extraction of the vitamine by the boiling water and the loss of this portion of the vitamine when the cooking water is discarded.

The vegetables, both cooked and raw, were dried at room temperature in a current of air produced by electric fans. This dried vegetable substance was then reduced to a fine powder and stored in glass-stoppered bottles.

The compartments containing the rats were kept clean at all times. Every morning that part of the basal ration remaining in the compartment was removed and the rat was left without food for about an hour. Then the daily allowance of the vegetable being tested, carefully weighed on an analytical balance, was placed in a special feeding box, which was so constructed that the rat would not spill or scatter the food. As a rule the vitamine-bearing substance was immediately consumed. Then sufficient of the basal ration was placed in a feed box for that purpose so that an excess would be left in the compartment the next morning. An ample supply of clean water was kept in the compartment at all times. The temperature of the animal room remained fairly uniform.

It is believed that this method possesses certain advantages over one that depends upon the normal rate of growth as an indication of the amount of the water soluble B vitamine in a food product. Where the results obtained are based upon the amount of the vitamine-bearing

substance that is required to maintain the weight of the animal only, the errors due to the storage of the vitamine in the body cells, and its elimination in the excreta, are eliminated. The natural craving of the animal for the vitamine leads to the complete consumption of the vitamine-bearing substance and to the immediate and complete utilization of the vitamine by the tissues of the body. If the amount of the vitamine consumed exceeds the maintenance requirement, an immediate increase in weight occurs, while if the amount of the vitamine received falls below the maintenance requirement, the weight decreases. The long period of preparation of the animal for the actual experiment allows it to become accustomed to the diet, the surroundings, and the handling. It also affords an opportunity to eliminate animals which for any reason might become unsuitable for the experiment. In short, this method offers standard conditions which reduce to a minimum any outside influences which might affect the weight of the animal.

The vegetables tested for their water soluble B-vitamine content were raw potato, boiled potato (with skins), boiled potato (without skins), baked potato, boiled spinach, raw cabbage, boiled cabbage, raw carrots, boiled carrots, boiled turnips, uncooked canned peas, and cooked canned peas. Dried and powdered Fleishmann yeast was used as a control.

Table No. 1 gives the daily dosage in milligrams of each vegetable substance required to maintain the weight of the rat for thirty days, when at the beginning of the maintenance period the weight of the animal was between 75 and 100 grams and its age between 100 and 130 days. In no instance did the weight of the rat increase or decrease more than 4 per cent during this thirty-day period. In all cases a marked increase in weight occurred when the vegetable substance was replaced by 500 milligrams of yeast at the end of the thirty-day period.

TABLE NO. 1

	<i>Daily dosage of the vegetable food product</i>
Yeast.....	50 mgms. (chart No. 1)
Potato, raw.....	65 mgms. (chart No. 7)
Potato, boiled, with skins.....	95 mgms. (chart No. 2)
Potato, boiled, without skins.....	125 mgms. (chart No. 8)
Potato, baked.....	100 mgms.
Spinach, boiled.....	85 mgms.
Cabbage, raw.....	70 mgms. (chart No. 6)
Cabbage, boiled.....	95 mgms. (chart No. 3)
Carrots, raw.....	70 mgms.
Carrots, boiled.....	105 mgms.
Turnips, boiled.....	105 mgms.
Peas, canned, uncooked.....	115 mgms. (chart No. 4)
Peas, canned, boiled.....	125 mgms. (chart No. 5)

As a means of expressing these results it may be considered that the amount of the vegetable food product required daily to maintain the weight of the rat for the thirty-day period, under the conditions of the experiment as to age, weight and method of feeding, contains one unit of the water soluble B vitamine.

Table No. 2 gives the number of units of the water soluble B vitamine contained in one gram of the different vegetable food products.

TABLE NO. 2.—*Number of units per gram of the dried vegetable.*

	<i>Units</i>
Yeast.....	20.0
Potato, raw.....	15.4
Potato, boiled, with skins.....	10.5
Potato, boiled, without skins.....	8.0
Potato, baked.....	10.0
Spinach, boiled.....	11.7
Cabbage, raw.....	14.3
Cabbage, boiled.....	10.5
Carrots, raw.....	14.3
Carrots, boiled.....	9.5
Peas, canned, uncooked.....	8.7
Peas, canned, boiled.....	8.0
Turnips, boiled.....	9.5

These findings agree with those of Osborne and Mendel⁸ who state that spinach, cabbage, turnip and carrot are not widely unlike in their content of water soluble B vitamine. However, they found that the potato contained slightly less of the vitamine than did the other roots tested, while this observation indicates that it has a somewhat larger content than turnips or carrots. Steenbock and Gross¹² found that raw potato and raw carrot contained about the same amount of the vitamine and that it required about 15 per cent of either of these roots to produce a normal rate of growth in a rat.

It has been shown by McCollum and Davis,⁶ Miller¹³ and others that the water soluble B vitamine is fairly stable at a temperature of 100° C. Chick and Hume¹⁴ found that considerable destruction of the vitamine occurred at a temperature of 120° C. They state that the vitamine is practically all destroyed in the process of canning the vegetable. This experiment showed that the canned peas retained a considerable amount of the vitamine (see table No. 2).

Daniels and McClurg,¹⁵ Whipple¹⁶ and Miller¹³ have shown that

¹² Steenbock, H., and Gross, E. G., *Jour. Biol. Chem.*, 1919, **xl**, 501.

¹³ Miller, E. W., *Jour. Biol. Chem.*, 1920, **xliv**, 159.

¹⁴ Chick, H. and Hume, E. M., *Proc. Roy. Soc., Series B*, 1917, **xc**, 60.

¹⁵ Daniels, A. L. and McClurg, N. I., *Jour. Biol. Chem.*, 1919, **xxxvii**, 201.

¹⁶ Whipple, B. K., *Jour. Biol. Chem.*, 1920, **xliv**, 175.

some of the vitamine was extracted by the cooking water and consequently was lost when this water was discarded. Their results are in harmony with those obtained in this experiment. The percentage of the vitamine lost in the cooking water would necessarily depend somewhat upon the length of time that the vegetable was boiled. The percentage of the vitamine removed by the cooking process in this experiment is given in table No. 3.

TABLE NO. 3.

	<i>Percentage of the water soluble B vitamine lost during the cooking process Per cent</i>
Potato, boiled, without skins.	48.0
Potato, boiled, with skins.	31.7
Potato, baked.	32.4
Carrots, boiled.	33.7
Cabbage, boiled.	26.5
Peas, canned, boiled.	8.0

The baked potato was submitted to a temperature considerably in excess of 100° C. The canned peas having been cooked in the canning process were recooked only for a very short period of time. The potato boiled without skins was peeled before cooking and the greater loss of the vitamine is probably due to the greater ease with which the vitamine could be extracted under these circumstances. The carrots and turnips were sliced before boiling.

One of the rats fed on the raw potato and one of those fed on the uncooked canned peas showed slight evidence of a disturbance of motor control of the hindquarters which subsequently disappeared while the animals were on the maintenance diet. No other evidence of polyneuritis was observed.

SUMMARY

The amount of the vegetable required to maintain the weight of a rat, under standard conditions as to weight, age, and method of feeding, is taken as a unit of measure of the amount of the water soluble B vitamine present in a vegetable.

A certain percentage of the water soluble B vitamine is removed from the vegetable food products by the cooking process.

The comparative amounts of the water soluble B vitamine present in a number of different vegetables are given together with the percentage of the vitamine removed by the cooking process.

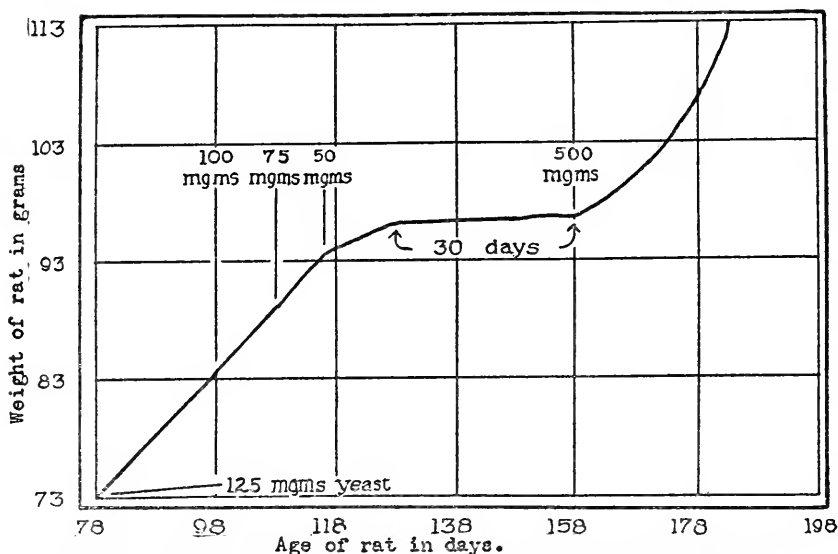


CHART No. 1.—The maintenance diet of the rat during the thirty day period was 50 milligrams of yeast daily in addition to the basal ration. When the 50 milligrams of yeast was replaced by 500 milligrams an immediate increase in weight occurred.

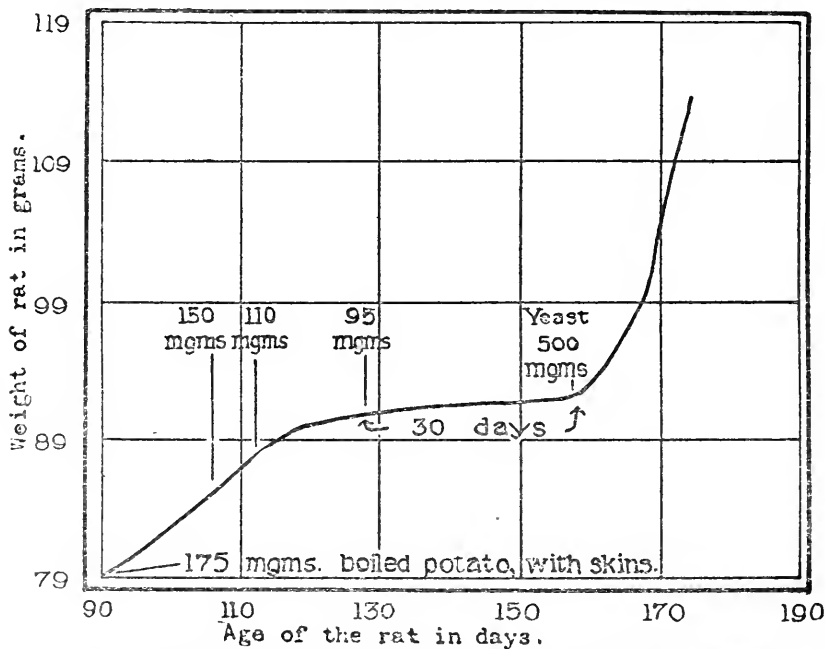


CHART No. 2.—The maintenance diet of the rat during the thirty day period consisted of 95 milligrams of boiled potato, with skins, daily, in addition to the basal ration. When the potato was replaced by 500 milligrams of yeast an immediate increase in weight occurred.

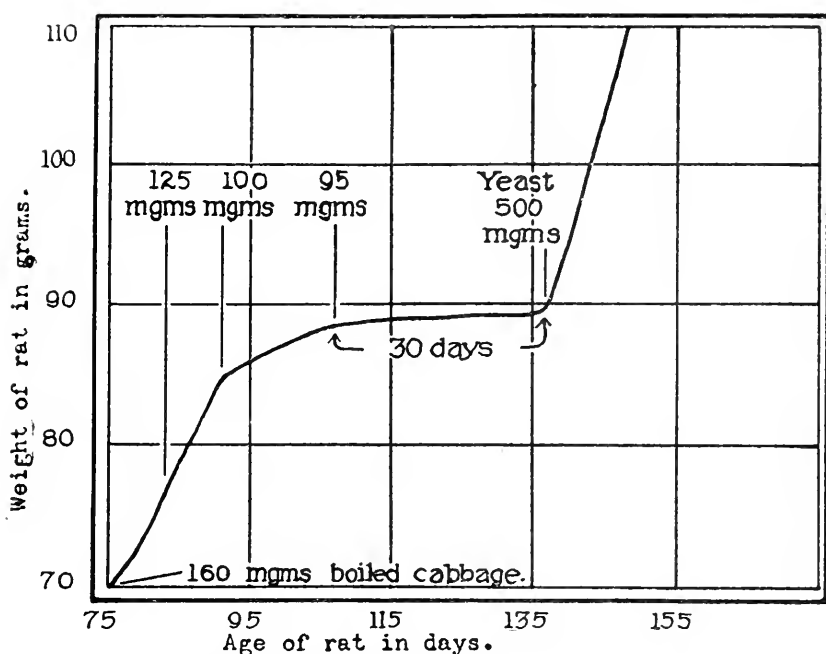


CHART No. 3.—The maintenance diet of the rat during the thirty days period consisted of 95 milligrams of boiled cabbage daily, in addition to the basal ration. When the cabbage was replaced by 500 milligrams of yeast an immediate increase in weight occurred.

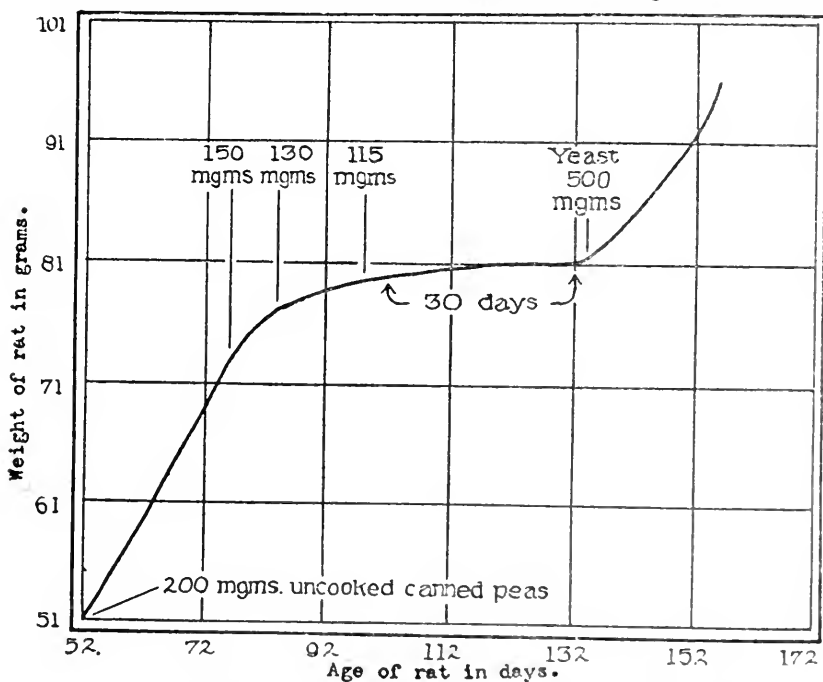


CHART No. 4.—The maintenance diet of the rat during the thirty day period consisted of 115 milligrams of uncooked canned peas daily, in addition to the basal ration. When the peas were replaced by 500 milligrams of yeast an immediate increase in weight occurred.

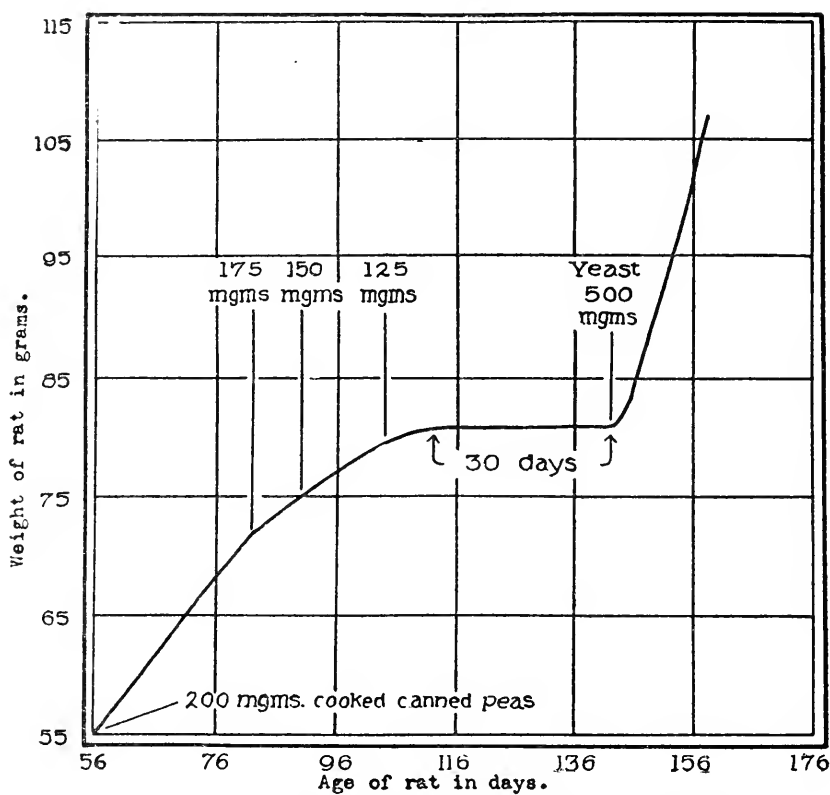


CHART No. 5.—The maintenance diet of the rat during the thirty day period consisted of 125 milligrams of the cooked canned peas daily, in addition to the basal ration. When the peas were replaced by 500 milligrams of yeast an immediate increase in weight occurred.

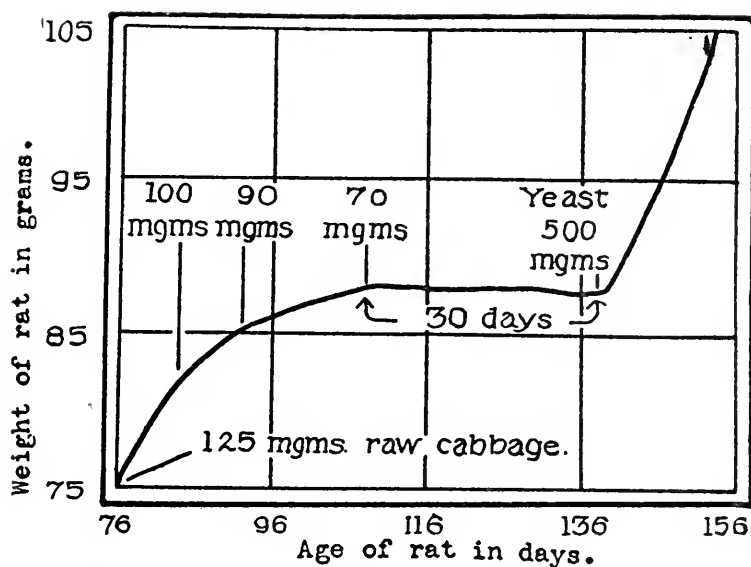


CHART No. 6.—The maintenance diet of the rat during the thirty day period consisted of 70 milligrams of raw cabbage daily, in addition to the basal ration. When the cabbage was replaced by 500 milligrams of yeast an immediate increase in weight occurred.

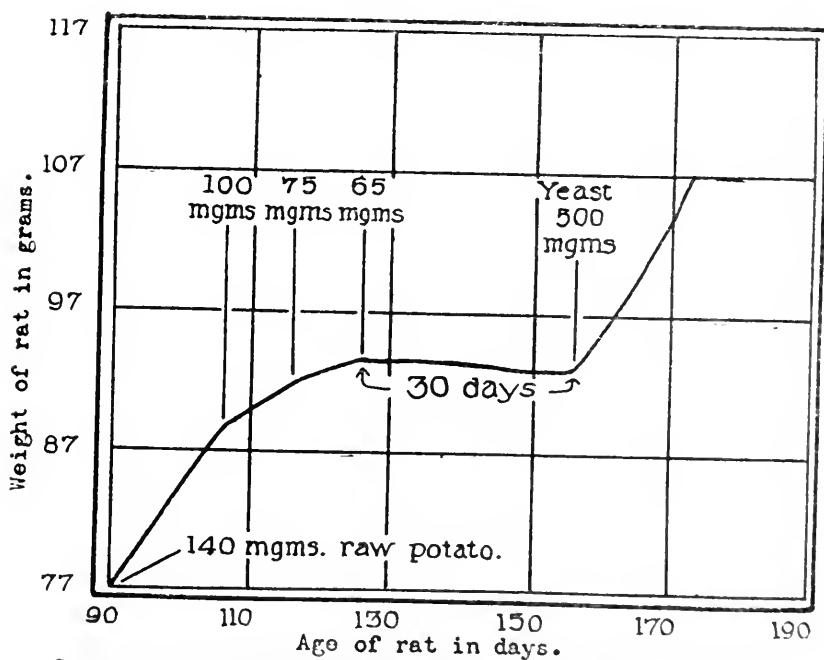


CHART No. 7.—The maintenance diet of the rat during the thirty day period consisted of 65 milligrams of raw potato daily, in addition to the basal ration. When the potato was replaced by 500 milligrams of yeast an immediate increase in weight occurred.

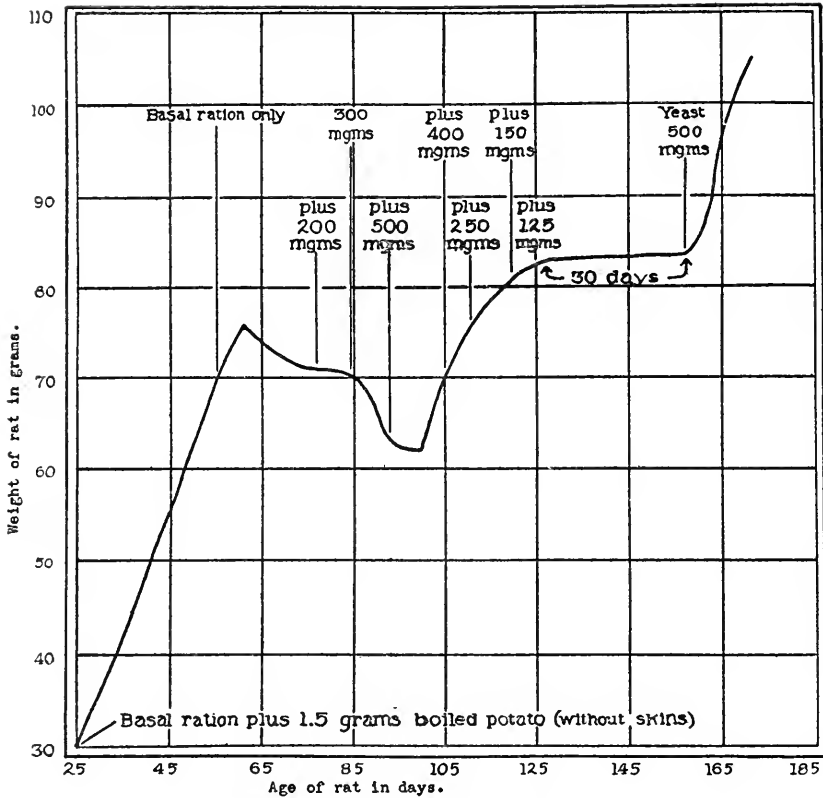


CHART No. 8.—The maintenance diet of the rat during the thirty day period consisted of 125 milligrams of boiled potato, without skins, daily, in addition to the basal ration. When the potato was replaced by 500 milligrams of yeast an immediate increase in weight occurred. It required 500 milligrams of the potato to restore growth after the weight had been allowed to decline. The rate of growth on 500 milligrams of the potato was as great as that which had taken place on 1.5 grams of the potato.

The Military Surgeon

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Original articles, items of news and matter of interest to the Services are welcomed. Requests for reprints should be made at the time of forwarding articles.

EDITOR,
COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

WHY LET GEORGE DO IT?

From various letters which have at times reached this office, it seems that there is a fairly general impression that contributions to the pages of *THE MILITARY SURGEON* are more or less limited to those by invitation. It is the desire of the editor to correct this belief and to make it distinctly known that original articles are gladly received from anyone, either in the Association or out, and are published if their merit warrants their appearance in the pages of the magazine.

Either this is so or there is the uncontrollable human instinct to "Let George Do It." There is never something for nothing and if each member of The Association is going to plead busy practice and full time hours there is going to be no George on whom to place the burden of proof—using proof in the publisher's sense.

Again, some seem to have the idea that material for *THE MILITARY SURGEON* must necessarily deal with matters of medicine and surgery confined altogether to that which relates to military practice. This is by no manner of means the fact and a review of what has appeared in the magazine will be convincing evidence that anything along interesting phases of medicine in any of its forms, save possibly obstetrics and gynecology, is suitable material for printing.

It is assumed that it is the desire of the members of The Association to have their official journal stand well up, as it now does, among

the list of medical publications and to insure this end, it is essential that there be a general interest and a general contribution to the matter which goes to make up the original contributions which appear in its pages.

It is hoped that this statement may be effective in inducing those who have interesting cases or matter which it is important for the profession to know, to forward it to this office for use in the journal.

JAMES ROBB CHURCH.

FRENCH CASUALTY STATISTICS

The following statistics are quoted from the "*Archives Medicales Belges*" and were compiled from a report made by General Toubert of the French Medical Service and read at a meeting at the Val-de-Grace hospital in Paris. Statistics, though dry reading in themselves, are always interesting as an index of what was, or might have been accomplished. They form a very reliable barographic reading of the heights to which we attained in our endeavor, and in connection with an analysis of our methods, a standard which we may set for future accomplishment. It is as yet too soon after the cessation of hostilities to expect unified reports comprising totals from all the nations in arms, a total which will eventually give us a better figure on which to base our deductions than partial ones from single nations. Nevertheless, even those from a single country merit consideration, and as France was so largely involved in the war, the record of her dead and wounded has the value of mass statistics, even though it is that of a single country.

It is difficult to consider in parallel columns mortality statistics of the World War with those of other ages. First because it was of so much greater magnitude than those which preceded it, and second, because limiting conditions, methods of infliction of wounds and means of curing them, were far and away different from those which confronted our forbears. The item of "missing" in the figures appended is a very grim tribute to the high specialization in the art of killing. In former wars a certain number of those who fell under this category might be rationally laid to the faint-hearted who resorted to absenteeism to escape the perils of conflict. Granting as probable under the scheme of human frailty that there still was a due proportion of this sort of thing in the World War, the total is too staggering to leave any other inference than that the perfection of artillery has made it possible to literally obliterate thousands of combatants. Of course it has been recognized, since the early days of the fighting that the figures as to death and disability would have to be revised in regard to casualties from bullets and shells. They have, in fact practically reversed themselves. The improvement in wound treatment has lessened mortality

and in addition has added much to the conservation of function to those who were wounded, being in this manner a distinct economic gain to the State by returning to peace-time life men able to care for themselves and others instead of being dependent for existence on the bounty of a tax-paying public which with the ingratitude of the republic rapidly translates the wounded hero to the category of the burdensome cripple.

The figures in respect to disease are significant. Aside from influenza there was no real epidemic disease among the armies and the mortality from wounds far overshadows that from sickness, a condition hitherto not to be considered.

Interesting as this table is, those which will appear when losses of all nations concerned are made public will be much more so and it is fair to presume that they will, as does this, bear testimony to the value of advances made in the science of medicine.

J. R. C.

The following are the principal facts from the excellent report which General Toubert presented on the 22d of July, 1920 at the Seventh Inter-allied Surgical Conference at Val-de-Grace Hospital, Paris.

I

(a) As far as the statistics of the wounded and of the wounds, it is sufficient to state that the total killed in relation to wounded is 18.36 per cent, or about one killed for four wounded with the following variations: 21 per cent in the warfare of fixed position and in the war of movement, 14.66. Those who had more than one wound comprise 20 per cent of the total wounded.

(b) In classing the wounds according to the causative agent, we find that prior to 1914 there was an average of 75 per cent of wounds by bullets. During the war of fixed position; that is to say, up to the beginning of 1918 there was 76 per cent of wounds by shell fragments, grenades, etc., as against 16 per cent by bullets and 8 per cent from other causes. During the war of movement in 1918 there was 58 per cent by shell fragments, 30 per cent by bullets and 12 per cent from other causes. The consequences from the point of view of risk of infection do not need to be dwelt upon here.

(c) Classed according to the possibility of evacuation, the wounded may be divided as follows: There was from 74 per cent to 80 per cent transportable to 26 per cent to 20 per cent non-transportable. Of the transportable about one-fourth was composed of slightly wounded; in the non-transportable the minority was composed of those who were held in advance sanitary formation and the majority consisted of the wounded who could be carried as far as the Evacuation Hospital to be operated on and cared for there. This minority and majority varied

much according to the character of the warfare. In April, 1917, on the Aisne there was 8 per cent of the total wounded classed as non-transportable and 17 per cent were transported and held in the evacuation hospitals. In August, 1917, at Verdun there was 4.5 per cent non-transportable and 17 per cent transportable who were at the Evacuation Hospitals. On the Aisne in October, 1917, there was 3.72 per cent non-transportable and 22.80 per cent of the transported were held at the evacuation hospital. On the other hand, this proportion was reversed during the operations in Flanders in July, 1917; at that time 40 per cent of the total wounded were treated as non-transportable and 30.76 per cent were held in the evacuation hospitals. This was because the small number of wounded allowed of their treatment with the formations of the advance.

(d) In regard to the number of operations performed considering only major operations, a total covering the period from August, 1917, to November, 1918, gives for the armies 29,553 operations for 251,314 wounded, or 11.75 per cent. In regard to radiology 98,524 localizations of projectiles in 1917 and 162,576 in 1918.

II

(a) The mortality of wounded treated varied in accordance with the sanitary formation concerned. The detailed statistics, the only ones available, show from the army of the advance for the three years, 1916-17-18 the following results:

1916	{ Advance formation mortality	4.16%	of those in hospital.
	{ Rear formation mortality	7.18%	of those in hospital. This on account of fighting at Verdun.
1917	{ Advance formation mortality	5.12%	of those in hospital.
	{ Rear formation mortality	0.73%	of those in hospital.
1918	{ Advance formation mortality	7.36%	of those in hospital.
	{ Rear formation mortality	1.29%	of those in hospital.

In the zone of the interior the mortality was for 1914-15, 2.25 per cent of the total wounded and for 1916-17-18, 0.94 per cent.

(b) The proportion of wounded entirely recovered after treatment can be stated in accordance with the statistics for the years of 1916-17-18 to be 79 per cent of the wounded treated.

The total recovery taking into account both sick and wounded was 50,904 for the second half of 1916 and 46,477 for the year 1917 and 60,003 for 1918. These figures are very creditable to the medical service.

(c) The proportion of "mutilés" is difficult to state. From August, 1917, to November, 1918, 5,920 amputations were recorded for 251,314 wounded who were passed through the advance formations, that is to

say, one amputation for every 42 wounded. Up to December, 1919, 40,824 war wounded were fitted with artificial limbs in France for amputation, and 54,156 received prosthetic apparatus for functional disability.

(d) Amongst those incapacitated other than "maillés" there were noted in April, 1919, 7,256 bony fistulae, 14,818 suffering from pseudarthrosis and 18,942 with lesions of the larger nerve trunks.

III

(a) As far as the total losses of the war are concerned expressed not in terms of percentage but in figures, the following approximate number may be given: 1,325,000 French soldiers either killed or missing of which there were—

674,700 killed by gun fire,
225,300 missing and probably killed
250,000 died from wounds

or a total of 1,150,000. In addition 175,000 died from disease.

The fire of the enemy killed six to seven times as many as disease. This is a unique fact in the history of great wars. It demonstrates very plainly the important role of both medicine and surgery in the war of 1914-18.

INTERESTING STATISTICS¹

	Number of deaths that occurred in present war, Sept. 1, 1917-May 2, 1919. Average strength approxi- mately 2,121,396.	Number of deaths that would have occurred if the Civil War death rate had prevailed.	Number of deaths that would have occurred if the Span- ish-American War death rate had prevailed.
Typhoid fever.....	213	51,133	69,164
Malaria.....	13	13,951 (c)	11,317
Dysentery.....	42	63,898 (b)	6,382 (b)
Smallpox.....	5	9,536	37
Pneumonia.....	41,747 (a)	38,962 (a)	6,086 (a)
Scarlet Fever.....	167	112	222
Diphtheria.....	100	1,188	149
Tuberculosis.....	1,220	9,574	631
Meningitis.....	2,137	3,859	4,081
Other diseases.....	3,768	34,881	15,587
Total for diseases...	49,412	227,094	112,656

(a) Includes deaths listed from measles, influenza, empyema, inflammation of the lungs and pleurisy, as well as pneumonia.

(b) Includes dysentery and diarrhoea.

(c) Includes malaria and remittent and congestive fevers.

¹ Authority: Summary of the operations of the Medical Department of the United States Army During the War. Compiled by Col. Weston P. Chamberlain, M. C. 1920 U. S. A.

PERSONNEL

April 6, 1917.	November 30, 1918, (Approximately)
Regular Medical Corps..... 491	Medical Corps..... 30,500
Medical Reserve Corps..... 342	Dental Corps..... 4,600
Dental Corps..... 86	Veterinary Corps..... 2,000
Veterinary Corps..... 62	Contract Surgeons..... 940
Contract Surgeons..... 181	Civilian Employees..... 10,700
Civilian Employees..... 450	Sanitary Corps..... 2,900
Regular Nurse Corps..... 233	U. A. A. Amb. Service..... 206
Reserve Nurse Corps..... 170	Nurse Corps..... 21,480
Enlisted Personnel..... 6,900	Enlisted Personnel..... 264,000

ARMY MEDICAL STATISTICS

What has been written above shows very clearly the importance of statistics to the profession in general. The following, quoted from the Report of the Medical Research Council (British) for the year 1919 and 1920, shows clearly the value of records and figures in governmental work as well as explaining why more complete statistics of British casualties have not as yet been published.

JAMES ROBB CHURCH.

"Steady progress has been made with the work of extracting and collating the medical and surgical statistics of the war. Accounts have been given in some detail in previous Annual Reports of the methods and purposes of this work, originally undertaken by the Medical Research Committee on behalf of the Army Council in 1914. At the close of 1919 this branch of the Statistical Department was moved to Dudley House, Endell Street. After the records and the great card index based upon them had been deposited there, H. M. Office of Works found that a weight was being placed upon the floors greater than they could bear with safety: the necessary changes in distribution reduced the superficial area available for work below what was expected and needed, and additional accommodation here or elsewhere will require early consideration.

"The record books in charge of the Department from Field Ambulances, Clearing Stations, Hospitals and other medical units, for indexing and statistical compilation, now amount nearly to 60,000 in number. This entails upon the War Office staff engaged here under the direction of Mr. Meiklejohn, Staff Officer for the Council, heavy work beyond the immediate tasks of extraction and compilation, in answering inquiries received from military departments, the Ministry of Pensions, Insurance Committees, and a large number of Dominion, Colonial and Foreign Governments. During the year now reviewed over 11,000 replies, many

of which required prolonged search, have been sent in answer to official inquiries of these kinds. By far the larger part of the work of the Registry Branch of this Department, however, has been concerned with the inquiries of the Pensions Ministry, of which upon an average over 150 a day have been dealt with throughout the year. Of these, not far from one-half are concerned with claims made by soldiers for which no support is found in their military documents. About 90 per cent of such claims are found to be supported by the actual medical facts as extracted here. In thousands of cases men may have been treated in several hospitals or other units without any trace of the fact appearing in their military papers. In a very small minority of cases, yet numerically and financially important, claims made on the Pensions Ministry are disproved by the records here. The work of the Pensions Ministry could not be done with justice or efficiency in the absence of these collateral records, made for quite different purposes by the Army Medical Service, and now for the first time, during or after any war, compiled and extracted by systematic and effective methods. It is plain that all the work of the Department upon this side should pass at the earliest convenient time from the direction of the Medical Research Council, and conferences upon this subject have been held already between representatives of the War Office, Pensions Ministry, and the Council.

“During the year the following has been added to the series of preliminary reports published for official use:

“A. W. Ormond: ‘An Analysis of 15,584 Ophthalmic Cases Treated at a Home Hospital.’ M.R.C. Statistical Report Series, No. 6.”

ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, January 1, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Army

Captains

William B. Tatum
John D. R. Woodworth

Medical Reserve Corps, U. S. Army

Majors

Abel Benson George
Patrick J. Griffin
Nelson Miles Holden
John Atkins Payne
Walter J. Shidler
E. Sanborn Smith
Jacob J. Sybenga
Mark A. Williamson
Richard Andrew Wilson
Isaac M. Wilzin

Captains

John D. Bradfield
Francis Marion Bruner
Albert Edward Buchanan
Hawkins Whitworth Corbett
Miles A. Heffelfinger
Joseph P. Graf
Walter Hannibal Henning
Louis S. Kelley
Richard Kimpton
Edwin Paul Kolb
Donald W. Mackenzie
Joseph Millard Marks
William E. McKinney

Lewis Thayer Mitchell
William Boyd Morrow
Stanley Hart Osborn
Harold A. Patterson
Thomas A. Poole
Irwin E. Ruhl
Cyrus W. Rutherford
Charles Francis Sawyer
Fred Henry Shorts
Lewis Galen Spradley
Frank Peter Thometz

First Lieutenants

Ned Albin Balding
Manuel Roman Benitez
Herman Charles Eckhardt
Creighton H. Ferguson
John P. Hall
Walter C. Lovejoy
William Roberts

Medical Corps, Wisconsin National Guard

Major

Frederick C. Rogers

United States Public Health Service

Passed Assistant Surgeon

George Henry Benton

Acting Assistant Surgeon

A. J. Ostheimer

COMMENT AND CRITICISM

A LETTER FROM MAJOR P. W. GIBSON

STATION HOSPITAL,

FORT LEAVENWORTH, KANSAS,

October 19, 1920.

TO THE EDITOR OF THE MILITARY SURGEON:

The MILITARY SURGEON for August published an article on "The History of the Overseas Division," by Lieut. Col. S. J. Morris. On page 192, the following remark is made, "It has been a mooted question whether each hospital should be supplied with its complete unit equipment before sailing or upon arrival. It appears by far the wiser plan to have the complete unit assembled and turned over to the commanding officer prior to departure from the port of embarkation, the supplies to accompany the unit. In this way there can be no delay in placing the hospital immediately in service upon its arrival." The plan contemplated by Colonel Morris is an ideal one, on paper. It was tried. It did not work. The same conditions that prevent its feasibility will again obtain, should there be extensive troop operations overseas.

Practically all of the base hospitals embarked through the port of New York. Base hospital equipment was assembled at Port Newark Terminal which was about 15 miles from any ship loading point. The supplies for a base hospital measured approximately 26,000 cubic feet. Their weight was very light for their bulk, four measurement tons equalling one weight ton. At the time of the Armistice we were loading on lighters for delivery to ship's sides at the rate of two hospitals every three days. One more day was required for a tug to deliver to a ship, another twenty-four hours was needed for actual loading one hospital into the ship. About forty ships were loading Army supplies on any given day. Cargoes of these ships were of necessity allocated before loading began. A ship usually loaded in a week, some of the larger cargo carriers taking much more than that time. The bulk of freight was carried in cargo ships that did not carry troops. The troop carrying ships usually had little cargo space available after troop baggage was loaded and for such space, medical department freight was too light. For example, the *Leviathan* carried more than 8,000 troops yet did not have cargo space for one base hospital. A ship was nearly always loaded with cargo before troops were assigned to it. The personnel of many base hospitals embarked a day or two after arriving at New York. Many of them sailed in British troop ships via England. There was an embargo which forbade the forwarding of American Army freight to France via England. Those are the reasons which made us discontinue the attempt to forward equipment with personnel. Conditions existing in France of which I am not wholly familiar also made this plan undesirable, the main reason being the time required (approximately one month) for supplies to reach the general supply depots from the base ports.

The next plan adopted was to load a hospital on shipboard as soon as it was placed on "priority." We fell behind, however, due to slowness in completing Port Newark Terminal and failure of manufacturers to deliver bedsteads, mattresses, blankets, and sheets and pillows. At the time of the Armistice, however, we had "caught up" to schedule. On that date eighteen base hospitals were at sea enroute to France.

The ideal plan from a cargo-space-saving standpoint would be to ship all articles overseas in bulk. However, the assembling and packing in a war-ridden country of the many small articles comprising a base hospital is not desirable.

I believe the following plan to be the best: Ship in bulk as general supplies bedsteads, mattresses, pillows, blankets, sheets and pillowcases. The other supplies sufficient for a given bed capacity should be packed and marked with a number or symbol. They should be assembled at or near a port of embarkation and shipped ahead of the personnel.

When the hospital personnel arrives overseas and its place of operation is designated, the Supply Division directs that a unit plus the number of beds desired be shipped to it.

P. W. GIBSON,
Major, Medical Corps.

A CORRECTION

January 15, 1921

COL. JAMES ROBB CHURCH,
Editor, MILITARY SURGEON,
Washington, D. C.

MY DEAR COLONEL CHURCH:

I wish to call attention to the report of the lecture given at the Army Sanitary School, A.E.F., on the primary suture of war wounds, published in *THE MILITARY SURGEON* for January, 1921, authorship of which is erroneously ascribed to Major Fernand Lemaître. There were two Lemaîtres in the French Army Medical Service, brothers, René and Fernand, equally well known, but along different lines. René is the general surgeon, and was among the first to advocate immediate excision of devitalized tissues and primary suture of war wounds. He is the author of the article in question. His brother Fernand is an otolaryngologist and achieved fame in the repair of maxillofacial injuries. I spent many hours in his hospital during my stay at Vichy in 1918. Fernand attended the meeting of the American Medical Association in 1919. I am personally well acquainted with both men, and am sure they would desire to have this unintentional mistake corrected.

Yours sincerely,

ROBERT H. IVY,
Lt. Col., Medical Reserve Corps, U.S. Army.

"ANY SKIN DISEASES IN YOUR PLANT, DOCTOR?"

The investigation recently begun by the U. S. Public Health Service into the causes and prevalence of skin diseases arising from occupational hazards is already yielding interesting fruit. Most striking of all, so far, is the discovery of the number of plants where many employees are suffering from occupational diseases, most of them skin, without either the plant physician or the men themselves realizing that their trouble is more than individual.

"In one plant," said Surgeon General Cumming, "where khaki cloth was made

up, inspection by a Public Health Service representative disclosed a woman who complained to the plant doctor that a slight cut from her scissors had given her eczema; a boy who carried bales of the cloth on his shoulders who complained that the dust from the bales had given him the same disease; and a very large number of women stitchers, whose duties compelled them to handle and sew the cloth continuously, who were suffering with inflammation of the mucous membranes of the eyes. Analysis of the dust showed that it contained a large percentage of chrome yellow and sulphur dioxide. Steps are now being taken to reduce the dust hazard.

In another plant, where a thousand men were working on machines where they were exposed to large amounts of "cutting" oils, superficial investigation showed that about a fourth of those examined were suffering from eruptions and other skin troubles. Neither the doctor nor the men had ascribed the trouble to the oils. Simple methods of preparing for work and of cleaning up at the end of each shift were prescribed and resulted in a marked decrease in the number of men affected.

In another plant where cutting oils were also used in large amounts, the plant doctor said that there had been a good deal of skin trouble, but that it had suddenly disappeared some weeks before from some unknown cause. Investigation showed that it had disappeared because the foreman, worried by the suffering of the men and their lessened production, had insisted on their anointing their hands with vaseline before they went to work and washing them with antiseptic soap at closing time. Skin troubles seem to be typical where cutting oils are used in any quantity.

How greatly the manufacturers as well as the men appreciate the work that the Public Health Service is doing is shown by two characteristic instances. A young physician who had charge of the medical and surgical relief work of a plant asked the Public Health Service doctor how he could make his employers raise his \$1,200 a year salary. The doctor told him that he was already being paid \$300 a year too much, for he was doing no more than the \$900 nurse who worked with him could do by herself. "Study the needs of your plant," advised the Service man. "investigate the causes of accidents and of headaches and colics; suggest to the management ways whereby these may be reduced and the lost time be saved; and see what will happen." Six months later the plant physician told the Service doctor that he had acted on the advice; and that his employers had doubled his salary in consequence.

Still more illustrative of the value of preventive hygiene is the case of a high-priced man who, at the insistence of the vice-president of a large manufacturing company, resigned from the Public Health Service, by which he was employed, in order to supervise the health of the workers in the company's factories. Later, the vice-president resigned; and the other officers, who had taken little interest in the health work, seriously considered dropping it. They broached the subject to the medical director, who produced his records and charts and clearly demonstrated how greatly accidents, illnesses, absenteeism, and turnover of employees had been decreased in direct consequence of his work. Not only did the company continue the work, but they promptly voted the doctor a thousand dollar increase in salary.

NASO-CONJUNCTIVAL FISTULA FROM GUN-SHOT WOUND OPERATIVE CLOSURE

In a recent search of literature I was unable to find a recorded case of successful operation to close Naso-Conjunctival Fistula.

This is naturally a rare condition, but there were several cases in the recent war.

Pvt. "D." was struck by a rifle bullet obliquely in the left eye. The bullet destroyed the eye and passed through the nose, emerging from the right side of

Sup-Maxilla. After healing was completed there remained a fistula from the conjunctival sac of the left eye into the nose, of the size of a lead pencil. It was very annoying to the patient, since every time he blew his nose, nasal secretion came into his eye and his artificial eye fell out. Furthermore, the scar tissue contraction at the funnel of this fistula was so marked that the palpebral aperture was drawn down at the inner canthus about one inch below the level of the inner canthus right side.

Unsuccessful attempts had already been made to close this fistula.

The procedure which I adopted and which was entirely successful, was as follows:

Operation, Sept. 20, 1919. A purse-string suture was passed in and out of the mucous membrane lining of the funnel connecting nasal and conjunctival cavities, then incision was made just above this suture line, and the tissues separated downwards with a Freer dissector to nasal cavity. The purse-string suture was tied; then a crescentic incision two inches long was made at inner canthus going clear through to periosteum. The tissues were elevated *en masse* and the whole inner portion of the orbital tissues rotated upwards and sutured in the elevated position; this brought conjunctival opening of the fistula at a higher level than the now closed lower end, and covered the sutured mucous membrane of the lower portion of the fistula by a full thickness of normal tissue which had been rotated upwards over it; and at the same time the location of the inner canthus, which had been depressed, was brought up to about its normal location. Healing took place without complications and the fistula has remained permanently obliterated.

RALPH H. GOLDTHWAITS,
Major, Medical Corps, U.S.A.

NEW YORK, December 9, 1920.

Mr. George E. Vincent, President of the Rockefeller Foundation, authorizes the following:

The discovery by Dr. Hideyo Noguchi, at the Rockefeller Institute for Medical Research, of a vaccine for yellow fever, introduces a new factor in yellow fever control through the possibility of making persons immune to yellow fever by vaccination.

Heretofore, work in yellow fever control has been entirely that of prevention of infection by controlling breeding places of the mosquito which carried the yellow fever germ. The isolation of the yellow fever organism, however, has made it possible for Dr. Noguchi to develop a serum which it is believed will reduce the mortality from yellow fever and a vaccine which gives promise of protecting the non-immunes against contracting the disease.

Already vaccination against yellow fever of people going to tropical countries is being made in New York. This work is being done at the Broad Street Hospital with vaccine furnished by the Rockefeller Institute.

The first shipment of vaccine for yellow fever from the Rockefeller Institute to tropical countries was made a year ago when three hundred bottles were sent to Mexico. Other shipments have been made since then, the latest on November 10. All vaccine supplied to Mexico is sent to the Mexican Department of Health which arranges for its distribution.

The Central American countries are so well convinced of the efficacy of Dr. Noguchi's vaccine that they are permitting travel without quarantine detention of those who have been successfully vaccinated.

BOOK REVIEWS

THE GREAT WAR AND THE R. A. M. C., by Bvt. Lt.-Col. F. S. Brereton, R. A. M. C.,
New York: E. P. Dutton and Company, 1919.

In this work Colonel Brereton records the work of the British Medical Service during the World War. It is of interest as a record of what was accomplished by a service which had just been reorganized and entered the field during a particularly trying time, that of the historic series of conflicts from Mons to Ypres. It details the difficulties met and the gradual evolution of the service from the beginning to the last of its duties during the conflict on the Aisne. The British War Office put at Colonel Brereton's disposal the records of the Medical Service so that the matter contained has the highest measure of accuracy. Since so much of value in civil practice has come out of the effort of the medical men in time of war the history of the difficulties encountered and the way in which they were overcome must be of more interest to those who are only occasional soldiers than formerly when there was so marked a line between the professional soldier and him who put on a uniform only at very occasional intervals and usually then only for a period of peace-time training. There is a Preface by Sir John Goodwin, Director General of the British Medical Service, who, himself, was one of the "Old Contemptibles."

The book is of some three hundred pages, is illustrated by ten maps showing battle positions at various times and has also a diagrammatic representation of the British Medical Corps formations. One of the appendices gives a thorough statement in respect to the situation in the German prison camp at Wittenberg.

It contains a deal that is interesting and the record of much self-sacrificing heroism on the part of the men who made up the sanitary service of the British forces.

PATHOGENIC MICROÖRGANISMS, A TEXT-BOOK OF MICROBIOLOGY FOR PHYSICIANS AND STUDENTS OF MEDICINE. Second Edition. By Ward J. MacNeal, Ph.D., M.D. Pp. 1-448. 221 illustrations. Philadelphia: P. Blakiston's Son and Co. 1920. Price \$4.00.

The author, in the Preface to the second edition, speaks of the present work as "an introduction to the study of pathogenic microorganisms," and a very good introduction it is, especially that part of the work comprising bacteriological technic and the general biology of microorganisms. These subjects are very thoroughly considered and the text is clear and instructive. The chapters treating of special microorganisms are excellent, although very brief, and the classification is simple and accurate enough for practical purposes.

The chapters dealing with the pathogenic protozoa are somewhat disappointing, largely because the descriptions are too condensed and much valuable data are not included. The same fault attaches to almost every consideration of this subject that is published as a part of text-books of bacteriology; in them all, the protozoa are too briefly considered to be of great value to anyone at all acquainted with these important disease-producing microorganisms, and erroneous impressions are created regarding their importance by the comparatively small amount of space covered in the brief and inadequate descriptions which are given in most of the text-books devoted primarily to bacteriology.

It is rather surprising to find no mention made of *Endamoeba nana* or of *Endamoeba gingivalis* in the author's consideration of the Rhizopoda, while the descrip-

tions of most of the protozoa leave much to be desired both from the standpoint of accuracy and detail. In fact, this portion of the book is little more than an index of the more important protozoa having to do with disease in man.

The book is very well illustrated and is well printed and bound. It should prove of value to the student of elementary bacteriology and to the general practitioner of medicine who desires to know the main facts of bacteriology and does not care to read the larger and more detailed works that are available.

CHAS. F. CRAIG.

PRACTICAL BACTERIOLOGY, BLOOD WORK, AND ANIMAL PARASITOLOGY. E. R. Stitt, A.B., Ph.G., M.D., Sc.D., LL.D. Sixth Edition. 1 Plate. 177 other illustrations. Pp. 1-633. Philadelphia: P. Blakiston's Son and Co. 1920. Price \$4.00.

In the new, sixth edition of this well-known and justly popular work, the author has adhered to his original plan of writing a laboratory manual containing useful clinical notes. The present edition contains an additional 77 pages of material and several new illustrations have been added to the text.

It is unnecessary to review in detail the contents of so well known a book, but the reviewer desires to state that the present edition has been greatly improved over what was before one of the best laboratory manuals in the English language and that it can be recommended as a dependable guide upon the subjects of which it treats. It is remarkably well up-to-date and the chapters upon streptococci, the influenza bacillus, and the blood flukes have been rewritten and a new chapter added, giving, in tabular form, the various diseases due to protozoa, helminthes, and arthropods. The section on blood chemistry has been improved by the addition of the methods of Folin, Myers, and others, and a new section is included presenting the laboratory procedures that have been found of greatest value in the investigation of the more important diseases, arranged in alphabetical form.

It is a really remarkable book, by reason of the immense mass of accurate information that is condensed within a comparatively small space, for the book can be easily carried in a coat pocket, and for this reason it will be found especially valuable to students. The illustrations are, in the main, excellent, and there are very few typographical errors. The reviewer believes that the new edition of this standard work will prove even more popular than the preceding ones and the author is to be congratulated upon the appearance of an edition that has evidently been really revised and, where needed, rewritten, in view of the many so-called new editions that are appearing of medical works, which are actually nothing but reprints of existing editions.

CHAS. F. CRAIG.

PRINCIPLES OF BIOCHEMISTRY. For Students of Medicine, Agriculture and Related Sciences. By T. Brailsford Robertson, Ph.D., D.Sc. Illustrated with 49 Engravings. Pp. 1-633. Philadelphia and New York: Lea and Febiger, 1920. Price \$8.00.

The author is to be congratulated upon the production of a book that is at once scientific and readable, although the subjects handled are of such a nature that it is most difficult to render the telling of them of interest to one who is not a specialist. There are chapters in this work that are as interesting as a novel and the literary style of the author adds much to the value of the book.

In the Introduction the author thus calls attention to the importance of biochem-

istry: "No subject, indeed, promises more immediate developments of stupendous significance to man. The control of life itself, no less, is the alluring aim and destiny of the medical and biological sciences, and the basis of every step in the acquirement of this control must inevitably be founded on a knowledge of the chemical processes which underlie and constitute life."

The work is divided into six parts as follows: Part I. The Foods. Part II. The Properties of Protoplasm. Part III. The Chemical Correlation of the Tissues. Part IV. The Chemical Processes which Underlie and Accompany Life Phenomena. Part V. The Products of Tissue Activity; and Part VI. The Energy-Balance of the Organism. Each subject is thoroughly considered from the biochemical standpoint and the conclusions arrived at are conservative and justified by what is known of the facts upon which they are based. The chapters devoted to the structure of protoplasm, the chemical mechanics of cell division, the general characteristics of the growth-process and the factors that influence it and normal and artificial fertilization are especially instructive and valuable.

The reviewer may be pardoned another quotation from the author as it so well expresses the thought of the scientist. Referring to the outlook for biochemistry and the difficulties to be overcome in the solving of even the apparently simplest problems of the constitution of living matter and the discouragements constantly encountered in biochemical research, he says: "The slow, hesitating, clinging grasp of science, like that of the many-tentacled denizens of the sea, cannot be loosened or evaded. Through many trials and failures, let the superficial appearance which hides the precious truth be as polished and impenetrable-seeming as it may, a flaw will be found, a foothold gained, and atom by atom, through centuries if need be, the very heart of mystery is unveiled. There is not, nor ever can be in our universe, anything which directly or indirectly can be made to assail the senses of man, that his intellect cannot ultimately fit into the supreme architecture of the mind, and there is not, nor ever can be, one thing which the intellect of man fully comprehends which he cannot in some measure appropriate and employ for the direction of his own destinies. But in what way will we employ those powers? That, indeed, is a riddle to which science can furnish no solution; its answer lies hidden from our senses, in the deepest recesses of the moral nature of man, but the responsibility for the choice, whatever it may be, rests not with the scientific discovery, save only in the degree to which he shares our common humanity."

The reviewer feels that he can recommend this work to the student and practitioner of medicine as a most excellent presentation of a most important subject.

CHAS. F. CRAIG.

SURGICAL PATHOLOGY AND MORBID ANATOMY, by Sir Anthony A. Bowlby, K. C. B., F. R. C. S., and Sir Frederick W. Andrewes, M.D., F.R.S. Seventh Edition, Illustrated, Philadelphia: P. Blakiston's Son & Co., 1920. Pp. 1-650. Price, \$8.00.

This is the seventh edition of the well-known work of Bowlby and Andrewes on *Surgical Pathology*, and has been revised and the old illustrations redrawn and many new ones added. Chapters have also been added upon Gas Gangrene, Shock, and Tetanus. The work was originally prepared for the students of St. Bartholomew's Hospital and is essentially a text-book, the descriptions being concise, simple, and well adapted for the instruction of students. Recent views of pathologists regarding mooted points are briefly stated and the conclusions drawn are those proven by the experience of the authors.

A careful examination of this book demonstrates that it is an excellent one to

place in the hands of the student of medicine. The entire subject of surgical pathology is considered and in such a way as to be of the greatest service to the student. The book is well printed and bound and the illustrations, which are numerous, are most excellent.

CHAS. F. CRAIG.

NOUVEAU TRAITÉ DE MÉDECINE. by G. H. Roger, F. Widal, and P. J. Teissier. Fascicule Premier. *Maladies Infectieuses*. Paris: Masson et Cie., 1920. Pp. 1-482.

This is the first volume of a new treatise on medicine, edited by Roger, Widal, and Teissier, to be complete in twenty-one volumes. If the remainder of the volumes sustains the high scientific level reached by the first volume, this will be one of the most noteworthy systems of medicine that has ever been published. The fullness with which every branch of every subject considered is treated, is unsurpassed in any work outside of special monographs upon the subjects, and approaches, if it does not actually reach, the ideal of what a real system of medicine should contain. In the discussion of each infection the etiology, i.e., the parasite, is as thoroughly discussed as in most works upon bacteriology, and the same statement is true of the discussion of the pathology, symptomatology, diagnosis, prophylaxis and treatment of the infection.

The volume opens with a general discussion of infection by Roger. This covers about one hundred pages and embraces a clear and scientific résumé of the subject, covering the history and definition of infection, the agents of infection, the causes favoring infection, bacterial toxins, the reaction of the organism to infection, the evolution of infections, the methods of diagnosis, and therapeutics, hygiene, and prophylaxis. It is noted that the author gives credit to American observers very freely in this discussion, which is refreshing in view of the silence regarding what has been accomplished on this side of the Atlantic noted in many foreign works upon medicine.

The septicemic infections are briefly considered by Sacuépée, while the streptococci and infections caused by them are considered by Roger. The description of the streptococci is up-to-date and as extensive as is usually given in text-books upon bacteriology. Roger gives the most recent classifications of these cocci followed by American and European bacteriologists and his discussion of the vaccine and serum therapy of streptococcal infections is excellent, as is also his description of erysipelas, which forms one of the most valuable contributions to the subject in recent years.

The pneumococcus and lobar pneumonia are considered by Menetrier and Stévenin. Here again, the treatment of the causative organism is as extensive as is usually found in text books of bacteriology, and contains every fact of interest or value regarding the pneumococcus. The authors give full credit to Avery, Chickering, Cole and Dochez in discussing the classification, into types, of the pneumococcus and throughout this contribution American authorities are frequently mentioned. In the discussion of lobar pneumonia the pathology is very fully described and beautifully illustrated by drawings and colored plates. This description of the pathology of the disease is far more detailed and accurate than is found in many text-books upon pathology. The clinical symptoms, complications, diagnosis, prognosis, and treatment are very thoroughly covered and the entire description, covering over one hundred pages is one of the best in any language.

Staphylococci and infections due to them is contributed by Macaigne and is an excellent presentation of the subject and the same may be said of this writer's chapters upon infections with *M. tetragenus*, the diplo-bacillus of Friedlander, and *B.*

proteus vulgaris. Gangrenous and putrid infections are treated of by Veillon, the various gas bacilli and their effects being fully considered.

The meningococcus and cerebro-spinal meningitis are discussed by Dopter in a chapter that is replete with valuable data. The history of the development of our knowledge of the meningococcus, its morphology, biological characteristics, and pathogenesis are thoroughly considered, and the importance of anti-sera against the various well recognized strains of the organism, in the serum treatment of the disease, is accentuated. The discussion of the symptomatology, diagnosis and treatment of cerebro-spinal meningitis is most excellent and includes the most recent additions to our knowledge.

The last chapter in the work is by Hudelo, on the gonococcus and gonococcic infection. After a comprehensive description of the gonococcus the author describes in detail the conditions brought about by infection with this organism. Acute and chronic gonorrhea, with the complications observed, naturally receive the most extended consideration, but extra-genital infection with the gonococcus, including the symptoms of localization of the organism in the viscera, as well as the types of septicaemia sometimes observed and due to the invasion of the blood, are thoroughly discussed.

The authors and publishers of this new treatise on medicine are to be congratulated upon the contents and appearance of this, the first volume, and if the succeeding volumes are of as great scientific and practical value, the completed work will be a lasting monument to the industry and scientific ability of the medical profession of France.

CHAS. F. CRAIG.

MEDICAL SERVICE IN MODERN WAR, by Lieut. Col. P. S. Bond and C. F. Martin, U. S. A.

"Medical Service in Modern War," by Lieut.-Cols. Bond and Martin, U. S. Army, gives in a concise and interesting manner the developed employment of sanitary formations and units in the American Expeditionary Forces in France to meet the requirements of both stabilized and mobile warfare.

In the exposition of the finally adopted standard of tactical use, so admirably given in this volume, the authors had the advantage of frequent conferences with those medical officers responsible for the molding of the medical service of the front and rear in France, whose extensive experience with the system of the Allies fitted them to select the salient features of all and to adapt them, together with what was good in their own service, to the purposes of the American Army, with a result that is now a matter of history.

The officer of the line will profit greatly by a perusal of this text, for in no other publication can be found so clearly expressed the absolute dependence of the line upon the medical service in the attainment of complete success by the application of the Medical Department's chief function in wartime—*Conservation of man power*—through sanitation and salvage.

The medical officer will find the complexity of duties in war clarified and simplified by a thorough reading and digestion of the text, while medical students of the Reserve Officers' Training Corps will find it an indispensable *vade mecum*.

While the new Tables of Organization have somewhat modified the nomenclature and equipment given by the authors, the employment of sanitary formations and units is unchanged, and the standard doctrine by them set forth remains unaltered.

COL. ALEXANDER N. STARK,

Med. Corps, U. S. A., formerly Chief Surgeon,

1st Army, American Expeditionary Forces.

THE LETHAL WAR GASES; PHYSIOLOGY AND EXPERIMENTAL TREATMENT, by Frank P. Underhill, Professor of Experimental Medicine, School of Medicine, Yale University. Published in New Haven: University Press, 1920.

In this volume, Underhill has published the results of collective laboratory studies on the toxicology of respired lethal gases, and has expounded several phases of the pathology and treatment of chlorine, phosgene, and chloropicrine poisoning. The volume will be of great value for any one wishing to undertake experimental studies of lethal gases. The methods of administering the gases, their control, and all the laboratory methods employed are fully described. The problems which are studied in this publication are the early dilution, subsequent concentration, and acidosis of the blood. Pulmonary edema and its relation to blood concentration, and the oxygen content of the arterial and venous blood are fully discussed. Under treatment, the indications for bleeding by venisection and the employment of infusions of physiological salt solution are also well expounded. The interpretation of the mode of death and the interpretation of symptoms are not satisfying from the clinical point of view. To conclude that concentration of the blood is the common cause of death does not seem justified in view of the fact that men who died during the period of extreme pulmonary edema did not present the clinical signs which we commonly see in concentration of the blood which is caused by persistent vomiting and diarrhea, or from dehydration attendant upon hyperglycemia. There are some phases of gas poisoning which are very important from a clinical standpoint that are not discussed in the work. Dilatation of the right ventricle and right auricle, multiple thrombi in the pulmonary circulation, bronchiolar spasm and hypertonus of the bronchiolar musculature, and hemorrhages in the central nervous system are not discussed.

Any one seeking information on the subject will find the book full of interest from the standpoint of laboratory procedures, and he will also find a valuable discussion of pulmonary edema, blood concentration, and anoxemia. These points of view are of course very important in the study of gas poisoning, but they do not include all the clinical problems. So far as concerns the laboratory point of view and the few aspects of gas poisoning which are treated in the book, the work is very satisfying, but the material contained in the book is wanting in educational value for one who is seeking any thorough criticism of the subject from a clinical standpoint.

C. F. HOOVER.

THE STORY OF THE AMERICAN RED CROSS IN ITALY. Charles M. Bakewell. New York: The Macmillan Company. 1920.

Perhaps Italy as much as any of the Allied nations was in need of the aid which the Red Cross offered to those who felt the heavy hand of war. Shortage of coal, flour and other necessities as well as general financial stringency throughout the country brought many of the poorer class in need. In addition to ministering to the aid of this class the Red Cross was actively concerned in its work among the units of the army. An interesting account of these activities is given by Mr. Bakewell in his book, which covers all phases. It is supplemented by appendices which give very full lists of personnel connected with the work as well as statistical returns of interest.

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THE SECOND DIVISION AT CHATEAU THIERRY, JUNE, 1918

COMPILED BY LOUIS C. DUNCAN

Lieutenant Colonel Medical Corps

(With five illustrations)

WHILE American divisions had some experience in trench warfare during the early months of 1918, and one regiment of the 1st Division made an attack at Cantigny on May 28, none was engaged as a whole until the 2d and 3d Divisions entered the line near Chateau Thierry during the first days of June. Even then these Divisions were but parts of French corps and armies and as such were under French strategic direction. Inasmuch as rearward evacuation of the wounded (all transport and hospitals back of division hospitals) is a function of corps and armies, the medical departments of these two Divisions were placed in a difficult situation. They could handle their wounded only as far as their division hospitals, where they were obliged to turn them over to the French medical authorities; yet in case of failure back of that point, the blame would certainly fall on the Americans.

On May 27 the German Army began another great offensive movement, this time on the southern line between Soissons and Reims. The French divisions along the Chemin des Dames were swept away and the Germans advanced southward until they reached the Marne, at Chateau Thierry and eastward, on May 31. On June 1 the enemy turned westward and pushed forward some six miles along the Ourcq. On June 2 and 3 the German drive was slowed up considerably, but not entirely stopped. The great salient made by this German offensive had a western flank extending from Fontenay (west of Soissons), southward to Chateau Thierry, and a southern flank, extending eastward from Chateau Thierry, along the Marne to Dormans, and then northeast by Fere-en-Tardenois to the old German line north of Reims.

It was at this crucial time, when Paris was again endangered, that American divisions were first thrown into the fighting line. The 2d and 3d Divisions were placed at the angle of the salient; the 2d west of Chateau Thierry and the 3d to the east.

The 2d Division had reached France in September, 1917, but the

Sanitary Train did not arrive until December of that year. The Division was then in the Bourmont Area, Vosges. Between March 12 and 16 it moved to a front-line sector, east of the Meuse, between Verdun and St. Mihiel, where there was some fighting, with resultant experience for the Medical Department in handling wounded men from the trenches. The units of the Sanitary Train then were: 1st, 15th, 16th, and 23d Ambulance Companies and 1st, 15th, 16th, and 23d Field Hospitals. Ambulance Co. 16 and Field Hospital 16 were animal-drawn; the others had motor transport. The Infantry regiments were the 9th and 23d, with the 5th and 6th Regiments of the U. S. Marine Corps.

MILITARY OPERATIONS ¹

From the Verdun front the 2d Division was moved to an area near Bar-le-Duc and then to another area, northwest of Paris. On May 30 the Division was suddenly ordered to the vicinity of Meaux, and on the 31st the 50-mile move, by motor truck, was begun. By 11 o'clock that night the Infantry had reached Meaux, where the brigades were started on the march forward, to a position west of Chateau Thierry and across the great Paris route. The Germans held the commanding Hill 204 and a line running through Vaux, along the railroad to Bouresches, and thence through Belleau Wood, Torcy and Bussièrès to Chezy. They were opposed by two depleted French divisions, worn out by five days of battle. On the right the 38th French Corps had one division north of the Marne and on the left was the 7th French Corps.

On June 1st the French Army Orders directed the concentration of the 2d Division around Montreuil, in support of the two French divisions, which held a line in the rear of Bussièrès, Torcy, Hill 133, south of Bouresches and Hill 138. The French had orders to drop back through the American lines. The Division then advanced and occupied the line: Hill 142 (north of Champillon), Lucy le Bocage, Triangle Farm, le Thiolet, to la Nouette Farm, on the right. The 3d Brigade held the right of the line, the 4th Brigade held the left. By evening the two brigades were in place. That same night the 23d Infantry with some other companies was sent to the left to fill a gap between Gandelu and Montigny.

The Germans subsequently pushed forward detachments in front of their line but made no further progress. The Americans now held the line, the two French divisions going to the rear on the night of June 3. The 23d Infantry returned to its proper place, on the left of the 9th.

The Germans attacked on June 4, but were repulsed. By June 5 all the smaller organizations of the Division had arrived and the complete Division took over the entire sector with a front of about 12 kilometers. The line then extended from the southwest corner of Bois

de la Marette on the right, through Bois des Clairimbaults, Triangle Farm, Lucy, woods northwest of Lucy, to a point on the Champillon-Bussi res Road, 800 meters northwest of Lucy. Triangle Farm was the dividing line between the two brigades. The Germans, having been several times repulsed, hesitated before the new element.

On June 6 the 4th Brigade (Marines) began the attack on Belleau Wood; advanced a kilometer toward Torcy and captured Bouresches, but was checked in the Wood. On June 7, 8 and 9 the attacks were continued, without artillery preparation; each day a little progress was made. This progress was slow and expensive. On the morning of June 10, after thorough artillery preparation, the 4th Brigade again attacked in the Wood and gained a line through Hill 169. Another attack, on the 11th, gained all of the Wood except the northern corner.

Meantime the 9th Infantry had advanced to the northern edge of Bois de la Marette. The 7th Infantry (3d Division) now relieved the Marine Brigade for six days, and the Marines were rested and furnished replacements. On June 23 they again attempted to take the northwest tip of the Wood, but unsuccessfully. Two days later, with the aid of concentrated artillery fire, they finally cleared Belleau Wood of Germans.

On July 1 the 3d Brigade, after a 12-hour preparation by artillery, attacked and captured Vaux and Bois de la Roche. The enemy counter-attacked next day but without success. This ended the contest. The 26th Division relieved the 2d, July 7-9. An advance of about two kilometers had been made.

MEDICAL OPERATIONS²

The Division was relieved [in the Verdun sector] about May 12 and moved by train or truck, or march, to an area slightly west of Bar-le-Duc. . . . The days of May 19-22 found the Division on the move again. The motorized trains skirted Paris and after a two-days run, via Chalons, Epernay, Montmirail, Meaux and Persan-Beaumont, arrived in the new area, of which Chaumont-en-Vexin, Oise, was headquarters. Influenza was epidemic. The trip in box cars exposed many and when the troops started on the march many developed that disease and were unable to march.

On Memorial Day an extensive program of sports was essayed. . . . The men had hardly returned to their organizations when orders were received to be ready for departure at a minute's notice. The 23d Field Hospital was ordered to evacuate all patients to Paris at once and the ambulances worked all night. The Infantry and Marines left early in the morning of May 31, in American trucks driven by Anamite drivers. By noon the motor trains were under way for Meaux. The convoy consisted of nearly all the motor transportation of the Division

and moved slowly because of its size and unknown destination. The French lines were rapidly falling back before the German massed attacks. The 5th Marines rested for the night in a wheatfield outside Meaux and made a forced march of 34 kilometers to a position near Marigny, with headquarters at Triangle Farm. The 6th Marines arrived by truck at Montreuil early on June 1, and took position on right of the 5th. The 9th and 23d Regiments of Infantry were placed in position on the right of the line.

REPORT OF SANITARY TRAIN²

“Regimental and battalion aid stations were established with their respective headquarters as the troops moved into original or new positions. These were for the most part in stone buildings in abandoned villages or farm groups and did not offer much protection against enemy artillery, though some were fairly well located when stone vaulted cellars could be found suitable. During the latter part of the operations, many of the battalion aid stations were in the woods and some dug-outs were constructed, but at the best these were only splinter-proof.

Each had one or more ambulances stationed with them or within call, as conditions required. Supplies were delivered them from the ambulance companies or ambulance-head, by returning or special ambulances.

No Sanitary Train headquarters had been organized and each section (field hospital and ambulance) functioned under the direct orders of the Division Surgeon. These sections—less 16th Field Hospital and 16th Ambulance Company (animal-drawn)—arrived at Meaux about 7 p. m. on May 31, proceeding to their several immediate destinations the same night, as follows:

1st and 15th Field Hospitals and 1st Ambulance Company, to Vincy.

15th Ambulance Company, remained bivouaced on the road near Meaux, being unable to clear the Division truck train with which it was convoyed.

23d Field Hospital and 23d Ambulance Co., to a large chateau in Meaux. Here a hospital was established, which, with the addition of two Bessoneau tents, gave a capacity of 150 beds. This hospital received patients from the main sorting station at the front and evacuated them to the Red Cross Hospital at Juilly. As the distance from various points on the front to Meaux was 40 to 50 kilometers, and an additional 25 kilometers back to nearest evacuation hospital, this second sorting or relay station was very valuable for dressing, resting, warming and feeding the wounded. This Company was joined here on June 4 by 16th Field Hospital; the two companies continuing to operate the

hospital until they were sent to more forward stations on June 9 and 11 respectively.

Cases handled:

	<i>Gassed</i>	<i>Wounded</i>	<i>Shell conc.</i>	<i>Injured</i>	<i>Sick</i>	<i>Total</i>
23d Field Hospital.....	41	797	20	22	88	968
16th Field Hospital.....	250	2,500	6	0	50	2,800
Total.....	291	3,297	20	22	138	3,768

Owing to lack of evacuation ambulances during the first few days, the divisional ambulances were compelled to do the rear evacuation in addition to the very long haul from the front, and were taxed to the utmost. They were supplemented by Sanitary and Supply Train trucks and touring cars.

Early the next morning, June 1, stations were assigned the organizations of the Train, and they proceeded to them immediately as follows:

1st Field Hospital and 1st Ambulance Company, to Bezu-le-Guery. Here 1st Field Hospital established a sorting station (triage) and operated same during the entire stay of the Division in this sector.

1st Ambulance Company, secured liaison and established ambulance service for the troops on the right front (9th and 23d Infantry), but was ordered elsewhere that night.

15th Field Hospital, to Cocherel, where it remained until June 4. No dressing station was established, but twelve wounded men passed through in this time.

15th Ambulance, Company to Dhuisy, where an ambulance dressing station was established and ambulances and dressings dispatched to the troops at the left front (5th and 6th Marines). The following morning these ambulances brought in the first wounded of our service in this sector.

Great numbers of wounded men continued to arrive. As they were all from the troops served by this Company and their evacuation covered such a great distance, the Company ambulances were insufficient and additional ones were drawn from the 1st Ambulance Co.

The 23d Ambulance Company, less four ambulances left at Meaux to serve that hospital, was also ordered to the front from Meaux, arriving on June 2 at Bezu-le-Guery, where it remained until the Division was relieved.

On June 3 the A. D. S. at Dhuisy was closed and the 15th Ambulance Company moved to Couprou, thence to Domptin on June 5. At each place an ambulance dressing station was established and the ambulance continued to serve the Marines on the left front.

June 11 this Company was ordered to Villiers, establishing an A. D. S.

for the slightly wounded from the front line. This station was operated until the Division was relieved.

1st Ambulance Company left Bezu-le-Guery before daylight of June 2 for Vendrest, where an A. D. S. was established and ambulances distributed for station and service with battalion aid station of 23d Infantry and auxiliary troops which, during the night, had been swung from their first position to this new one on the left front. A considerable number of wounded men were dressed and evacuated through this station. On June 4 the Company moved back to Bezu-le-Guery, where it remained during the stay of the 2d Division in this sector.

The 16th Ambulance Company, animal-drawn, having marched overland, did not arrive in the area until June 3, when it reached Cocherel, bivouaced, and proceeded the following day to La Sablonniere; thence on June 6 to La Langue Ferme, where an ambulance dressing station for the slightly wounded was established at 7 p. m. of the same date. About 125 wounded men were attended and evacuated that night. The following day—June 7—this station was moved a half-kilometer up the road to Ventelet Ferme, to bring it nearer to the main road and make it more accessible for the walking wounded, who naturally drifted down this main road. Here it remained and operated until the Division was relieved.

On June 4 all 16th Ambulance Company ambulances (19 animal-drawn) were distributed and attached to Artillery regiments—three to each. This was done to give ambulance service to battery positions not accessible to motor ambulances and to accompany them on their frequent shifts of position. They remained permanently with these regiments.

On June 4 the 15th Field Hospital was moved to Chateau La Rue on the main La Ferte—Chateau Thierry road and for three days functioned as auxiliary sorting station with 1st Field Hospital at Bezu. This plan was tried with a view to resting the personnel of each hospital on alternate days, but it resulted in too much dispersing of sorting and evacuating forces, supplies, ambulances, etc., and not in a commensurate conservation of the work of the personnel. This dual sorting was abandoned June 15 and on the 16th of June the Company moved to Luzancy, where it remained until the sector was turned over by the Division.

	<i>Gassed</i>	<i>Wounded</i>	<i>Shell conc.</i>	<i>Injured</i>	<i>Sick</i>	<i>Total</i>
Treated by 15th Field Hospital at Chateau La Rue.....	131	776	58	39	108	1,112

The 16th Field Hospital (animal-drawn) arrived at Meaux on June 4, taking station and functioning with the 23d Field Hospital until June 11. It then proceeded to Luzancy, where a building formerly

used by the French as a hospital, was supplemented by tents to a capacity of 800 and, conjointly with 15th Field Hospital, was operated as a Division hospital for the gassed and the sick.

Cases treated.

	<i>Gassed</i>	<i>Wounded</i>	<i>Shell conc.</i>	<i>Injured</i>	<i>Sick</i>	<i>Total</i>
15th F. H.....	858	22	45	52	800	1,777
16th F. H.....	1,500	0	0	0	40	1,540
Total.....	2,358	22	45	52	840	3,317

500 of these were returned to duty without further evacuation.

On June 6 one-half the officers and enlisted personnel of the 23d Field Hospital were ordered to assist at the sorting station of 1st Field Hospital at Bezu. They remained here until June 10, when they and the remainder of 23d F. H., which had been left with the 16th Field Hospital at Meaux, proceeded to La Ferte-sous-Jouarre. Here they secured two buildings which had been maintained by a Catholic sisterhood as a city hospital, and established a surgical hospital for non-transportable patients. This hospital was well supplied with beds, mattresses, sheets, and pajamas. An X-ray apparatus was obtained, and many instruments. Around these supplies and upon this experience was conceived the idea of continuing one field hospital of the Division as a mobile surgical hospital. Within a few days enough extra officers and eighteen American nurses, (female), were secured to provide personnel for surgical teams. With the addition of three Bessoneau tents a total capacity of 125 beds was provided. This hospital continued to function with from two to five surgical teams until the hospital was turned over to the 26th Division on July 7. The nurses and extra surgical teams, together with the teams which had previously been definitely assigned to the 2d Division, remained with the 26th after our departure; also the larger part of the equipment.

Cases treated: Gassed, 4; wounded, 923; shell conc., 9; injured, 30; sick, 17; Total, 983.

On June 4, U. S. A. A. C. Unit 502 joined, with twenty Ford ambulances. The unit was stationed at the ambulance head at Bezu and was immediately placed on forward work, evacuating from regimental and battalion aid stations; thus releasing the majority of the larger ambulances (G.M.C.) for evacuation from sorting station to rear field hospitals and to evacuation hospitals. . . .

July 1, in preparation for the offensive against Vaux, 1st ambulance Company sent ambulance dressing station personnel and equipment to 9th Infantry to reinforce the regimental aid stations. An advance Medical Supply dump was arranged forward of the regimental aid station on the route of evacuation from battalion aid stations and

returning ambulances utilized to carry supplies forward when needed.

In anticipation of need when the attack should have progressed sufficiently, stations were prepared and supplied in two large vaulted cellars in Monneaux, for use as battalion aid stations.

The Division Medical Supply Unit arrived at Meaux on June 1 and immediately set up and began to issue supplies, which were sent forward on returning ambulances. Supplies were obtained from the American Red Cross in Paris, American Mission at Soissons, and the Medical Supply Depot at Coulommiers; but during the first part of operations there was a shortage of blankets, litters and pajamas for gas cases, etc. After the establishment of a medical supply depot at Lieussant, with an excellent system of truck service of distribution, less difficulty was encountered in securing supplies.

On June 9 the Medical Supply unit was moved to La Ferte and distribution to forward organizations facilitated.

The ambulance head was established at Bezu-le-Guery on June 8 and all ambulances pooled for service directly under the orders of the Director of Ambulance Companies. The location of the sorting station also facilitated the coordination and conservation of the ambulance service both forward and to the rear. During attacks in which the ambulances were insufficient for rapid evacuation of all wounded, the trucks of the Sanitary Train were utilized, and if these did not suffice trucks from the Supply Train were called for.

As all telephonic communication had to be in code, a system of numbers was used to designate regiments, battalions or places. Each regiment was given a block of ten, so that the first regiment had Nos. 11 to 19, the second 20 to 29, etc. A simple telephone call, "42—three Jones," indicated that 4th Regiment, 2d Battalion Aid Station, desired three ambulances.

An advance Medical Supply dump was maintained at Ambulance Head and supplies needed at forward stations delivered by returning ambulances.

From the beginning Ambulance Company litter bearers were sent to the front to supplement those of regiments, as these required and the number available permitted. As many as 160 at one time were detached from their companies for this duty. They were usually sent forward in returning ambulances. Relay litter-bearer posts were also established between battalion aid stations and ambulance posts when litter haul was long and ambulances could not reach the forward stations.

The triage at Bezu occupied a church and an adjoining school building, the latter being used for dressing and réchauffement and the former for collecting and evacuating. In a small stone building in the same



Wounded men arriving from 2nd Division, at 15th Field Hospital, Montreuil, France, June 7, 1918.



Wounded men arriving from 2nd Division, at 15th Field Hospital, Montreuil, France, June 7, 1918

(To face page 260)



Wounded Men arriving from 2nd Division at 15th Field Hospital, Montreuil, France, June 7, 1918.



1st F. H. Unit, 2nd Div, Interior of old church now being used as ward for wounded soldiers just arrived from the front.

lot a shower-bath with a heater and eight heads was set up. With a well-ventilated tent fly for undressing and a closed tent for dressing patients, an excellent group for the treatment of gassed cases was maintained. This appeared a bit crude but could, and did, bathe and handle as many as 100 cases per hour.

Mobile Surgical Hospital No. 1 on June 8 and a few days later Evacuation Hospital No. 7, at Chateau Montanglaust, near Coulommiers, opened to receive our patients. This shortened our evacuation by 25 kilometers but still was 30 kilometers from our sorting station. This long evacuation haul was inimical to the dangerously wounded or severely shocked, many of whom were saved by our own divisional surgical hospital.

From June 15 until the Division was relieved no changes were made in the location of our sanitary units and the system of evacuation was maintained."

EVACUATION TO BASE HOSPITALS³

(Extracts)

June 1.—At 9 a. m. I arrived at Meaux and found the troops had arrived (2d Division) at 1 a. m. that day. They were widely scattered and I was unable to learn what portion of the line they would occupy.

As this Division [2d] had been thrown into the area without previous knowledge of our GHQ, there had been no opportunity to hospitalize its rear. The only hospital, other than French, upon which we could rely was at Juilly. This was a Red Cross unit, under the supervision of American Red Cross Military Hospital No. 1 at Paris. It had 280 beds but not sufficient personnel for the care of so many patients. I at once asked the Commanding Officer, Capt. Charles Mixter, M. C., to make every effort to increase the number of beds to 800. I decided to rush into Paris and expedite this work. This I did and the assembly of property was begun inside 48 hours.

June 2.—"Meantime I had wired Colonel Wadhams at GHQ, stating that there was no adequate provision forward and requesting that operating teams, Groupe Complimentaire, hospital trains, ambulance transport and personnel be placed at my disposal. It had also just come to my notice that the 3d Division was on the right flank of the salient [Chateau Thierry] at Vielle Maison. I proceeded to that point and at once requested the American Red Cross in Paris to install with supplies being reserved there for Army use, a 600-bed hospital at Montmirail. The Red Cross proceeded to start the movement at once.

June 3.—Dr. Burlingame [of the Red Cross] visited Montmirail and stated to me that the Red Cross would send camions loaded with supplies etc. provided the Army would furnish personnel. To this I agreed and returned to Paris.

June 4.—[Red Cross Hospital directed to Jouy-sur-Morin.] General Ireland and Colonel Wadhams visited Meaux.

June 5.—The Red Cross hospital at Jouy-sur-Morin was ready for patients. [This was for the 3d Division.] Wounded from the 2d Division began to overflow the hospital at Juilly on June 3, but supplies were arriving from Paris, increasing the capacity to 700 or 800 beds. On June 4 it was necessary to ask the Chief Surgeon,

District of Paris, to send a convoy of ambulances to evacuate from Juilly to Paris. Arrangements had been made for a hospital train, but less than a trainload of patients had accumulated. On June 5 another convoy was sent from the 2d Division to Red Cross Hospitals Nos. 1 and 2 in Paris.

The operating teams and medical supplies had arrived at Meaux on June 4, but the latter were sent to Coulommiers, where a supply depot was to be located. By this time the Division Surgeon, 2d Division, had established a field hospital for non-transportables at Meaux.

The personnel at Juilly began to be taxed beyond endurance, and the operating teams which had arrived at Meaux were sent to Juilly. I had recommended to General Ireland and Colonel Wadhams that two evacuation hospitals be sent to this area at once and was informed that No. 8 would arrive at Juilly shortly and No. 7 would report as soon as possible. At this time three U. S. A. A. Service sections, which I had requested, had reported but were not under my control. Each of these three sections had twenty ambulances. They were assisting the Ambulance Section of the 2d Division in transporting their wounded from the front lines to Juilly.

By afternoon it became apparent that the Juilly hospital would have more wounded than it could handle. I called up Colonel Bingham, Chief Surgeon District of Paris, and requested him to have all available operating space and all operating teams ready to receive wounded from the 2d Division on the following morning. I also requested that he send all available ambulances for the purpose of transporting the wounded from Juilly to Paris. Even this provision appeared insufficient, and I arranged for the reception of wounded men in all available French hospitals.

June 6.—All available ambulances and many trucks were evacuating from the front line of the 2d Division to Juilly. Although more operating tables had been installed, all were occupied. More operating teams had arrived but they were still insufficient. As a result all patients were carefully sorted and those able to bear it were sent direct to Paris. Several convoys were forwarded this day.

June 7.—The first hospital train arrived at Juilly. On June 6 and 7, 1173 patients were transferred. On these two days about 1700 patients were handled by this small hospital and 1183 were evacuated to Paris. The personnel averaged 20 hours of labor per day for four days. It was adequate for normal periods but not for this rush. Had it been possible to foresee this emergency the congestion could have been avoided, but the Medical Department had no warning.

June 8.—Evacuation Hospital No. 8, with personnel, reported at Juilly. As the equipment had not arrived, this personnel aided for a time the Red Cross hospital.

June 9.—The hospital for non-transportables [23 Field Hospital] was moved from Meaux to La Ferte-sous-Jouarre and the X-ray plant installed.

June 10.—Colonel Stark, Chief Surgeon 1st Army, and Colonel Wadhams arrived and I secured a number of changes; among others that the three ambulance sections report to me. This was done.

June 11.—I received word that Auto Chir (Mobile Hospital) No. 1 had been ordered to Coulommiers and that Evacuation Hospital No. 7 would soon reach the same place, both to function as one unit at Chateau Montanglaust.

June 12.—The hospital for non-transportables of the 2d Division had been installed at La Ferte. The 2d Division had received and delivered another attack and there were German wounded as well as our own to be cared for. I visited La Ferte and found the hospital congested and sorting not carefully done. This defect was corrected.

June 14.—Evacuation Hospital No. 7 arrived at Montanglaust. The auto-chir [Mobile Hospital No. 1] was already in operation. These units worked together very satisfactorily.

June 15.—Wounded men from the 2d Division were now all being received at Evacuation Hospital No. 7 and the hospital at Juilly was available for the 4th Division.

On the morning of the 15th the 2d Division sustained severe gas casualties. Seven hundred and seventy-seven gassed cases appeared and were easily handled at the division gas hospital at Luzancy.

June 16.—At this time there were 325 beds at Jouy-sur-Morin. I took steps quickly to increase the number to 500 and ultimately to 700. The Red Cross sent material and within 48 hours 500 beds were ready.

June 17.—The 2d Division had sustained the following casualties: wounded, 2,877; gassed, 1,262; sick, 313. On this date the first hospital train left Evacuation Hospital No. 7. The Juilly hospital was receiving no wounded, caring only for the sick and a few non-transportables.

June 20.—Twenty-eight hundred and sixty-three patients had been evacuated from Juilly, and four hundred and eleven remained; a total of thirty-two hundred and seventy-four handled in sixteen days. The majority of these were sent to American Red Cross Military Hospital No. 1 and No. 2 at Paris. Except in emergencies all cases were operated on, but during the rush periods many patients were transferred before operation.

June 23.—Headquarters 1st Corps U. S. arrived at La Ferte.

June 24.—Mobile Hospital No. 2 became available.

June 29.—Orders were issued (from G.H.Q. at Chaumont) designating me as Chief Surgeon, Paris Group. I went to La Ferte to see Colonel De Witt, G-4, and learned that the Group was not yet ready to function.

[Until this date Colonel Hutton had been Liaison Officer with the 2d Division. There is much more of interest and value in the Report of Medical Operations by Colonel Hutton, but space allows only a brief mention of the first weeks when conditions were anomalous and grave.]

STATEMENT BY COLONEL S. H. WADHAMS, Medical Corps.
Concerning Wounded near Chateau Thierry.⁴

Certain newspaper correspondents having severely criticized the handling of the wounded of the 2d Division in the early days of June, 1918, and having stated that "the Medical Department of the Army failed to meet its responsibilities," Colonel Wadhams made the following official statement for the Inspector General, who was detailed to investigate the matter:

"In order to understand what these responsibilities were at that time, it is necessary to know the agreement made by the American G. H. Q. and the French G. H. Q. when the American troops were turned over to the French to serve in the French Armies. Under the terms of the original agreement, the Medical Department was obliged to furnish the personnel and equipment of the Sanitary Units belonging to the

Division. All matters of supply, hospitalization and evacuation were to be taken care of by the French. It became immediately apparent that the question of medical supplies for our divisions serving with the French could not be handled in a satisfactory manner by the latter. For this reason the agreement was modified to the extent that medical supplies and gas defense material would be furnished by the Medical Department, A. E. F., but the hospitalization and evacuation still remained for the French to accomplish.

When the Second Division was withdrawn from the line and sent to the west of Paris, it was originally understood that it would ultimately take position in the sector occupied by the First Division. Acting on this belief, a medical officer attached to G-4, G.H.Q., visited the Second Division, then in the vicinity of Chaumont-en-Vixen, to make sure that the arrangements for hospitalization and evacuation were satisfactory. On the last day of May information was received which indicated that the destination of the Division might be changed. Therefore, the same officer was again sent to visit the Division to see if other arrangements were necessary for hospitalization and evacuation. This officer was Lieut.-Col. A. D. Tuttle, Medical Corps, and his last visit covered the days of June 1st and 2d.

On Sunday, June 2d, word reached the Assistant Chief of Staff, G-4, that the Second Division's orders had been changed and that it was moving from the area it had occupied northwest of Paris to the vicinity of Meaux, northeast of Paris, and that it might be expected to come in contact with the enemy at almost any time. It was also learned that the movement had been made in great haste, that the Sanitary Train of the Division had been very widely separated, and that it had been impossible entirely to reassemble it up to that time. On the same date Colonel Tuttle visited the Headquarters of the 6th French Army, with which Army the Second Division, A. E. F., was incorporated, and was informed that, due to the military situation, it would be impossible for the French fully to meet their obligation to hospitalize and evacuate the battle casualties from the American Division, and, it was therefore requested that the A. E. F. medical authorities do what they could in this respect. Having communicated such details as he could by wire Colonel Tuttle then hurriedly returned, by automobile, to G.H.Q., A.E.F., to report conditions in full. While en route he met Colonel Hutton at Viels Maison (3d Div. area) and briefly discussed the situation with him.

Owing to the shortage of Medical Department personnel in France, the situation presented many difficulties. Nevertheless, the following steps were immediately taken: (1) Operating teams were ordered by telegraph to report at once to the Red Cross Hospital at Juilly, near Meaux, and two operating teams were ordered at the same time to report to the Division Surgeon at Meaux; (2) Ten large Bessoneau ward tents, belonging to the Red Cross, which were in storage at Camp de Mailly, were ordered by the Assistant Chief of Staff G-4 to be sent by truck to the vicinity of Meaux. This order was telegraphed personally by the A. C. of S. G-4 at eleven o'clock at night (June 2) to the commanding officer at Mailly. Then on the morning of June 3 further provisions were made: (3) Ten truckloads of emergency medical sup-

plies were ordered by telephone from the Medical Supply Depot at Cosne to Meaux; (4) A mobile surgical hospital in storage at Paris was ordered sent to the Division Surgeon at Meaux by automobile truck; (5) The Assistant Chief of Staff G-4 ordered a truck train to Is-sur-Tille to be loaded there with various reserve supplies. Included in these supplies were all the necessary drugs and appliances for caring for gas patients, as well as 1000 extra uniforms, for both the Second and Third Divisions, the latter to be used for changing clothing of gas patients. In addition, three sections of the U. S. A. Ambulance Service, of twenty ambulances each, were ordered to report to the Division Surgeon at Meaux to augment the divisional ambulance transport. One Evacuation Ambulance Company which had just arrived at St. Nazaire was ordered to proceed overland to Paris, there to be held in reserve.

Col. Paul C. Hutton, Medical Corps, attached to G-4, had been ordered in the latter part of May to report to the Chief Surgeon of the French Army with which the Second Division served. He was instructed to make all possible arrangements for the procurement of hospital facilities to meet the needs of this Division.

On the afternoon of June 3 an order was issued directing Lieut.-Col. R. U. Patterson, Medical Corps, to report to the Division Commander, Second Division, for the purpose of placing his services at the disposition of the Division Surgeon. The Chief Surgeon, A. E. F., at Tours, was notified by telephone of the disposition taken and was made acquainted with the situation which existed regarding this Division. I left General Headquarters at five o'clock in the afternoon of June 3 and met the Chief Surgeon in Paris on the morning of June 4. We proceeded to Meaux and, together with the Division Surgeon, examined the disposition he had made to meet the situation. We went on to the Division Headquarters, and, the Division Commander being absent, had a personal interview with the Chief of Staff, who expressed himself as thoroughly well satisfied. On our return from Division Headquarters we called on *Médecin Inspecteur* Lasnet, Chief Surgeon of the 6th French Army. We then proceeded to the Red Cross Hospital at Juilly, where the wounded were beginning to arrive. We found that there was a shortage of personnel, although part of the personnel which was ordered on June 2 had arrived and had been augmented by certain officers detached from the Division Sanitary personnel. It was, however, perfectly apparent that steps should be taken to evacuate this hospital in the immediate future. The Juilly hospital, it might be well to state, had, at that time, facilities for only 225 patients, but a request had been made to the Red Cross to furnish the material to expand it to its maximum capacity—approximately 700 beds—and this was going on. Immediately upon his return to Paris, the Chief Surgeon requested of General Headquarters that Evacuation Hospital No. 8, the only one in France available, and then en route from Brest, be sent immediately to Juilly to furnish the necessary personnel. Upon our return to Paris, efforts were at once made to secure permission from the French authorities to send a hospital train to Juilly for the purpose of evacuation. This operation was attended with some delay, but a hospital train was sent out the next day and the congestion relieved.

It developed, however, that owing to the limited personnel at Juilly it would be impossible for the wounded to be evacuated by hospital train; inasmuch as this method necessitated the handling of patients twice: placing them in the ambulances and carrying them to the station, and there again handling the litters to place them in the train. For this reason it was decided to make this secondary evacuation from Juilly to Paris by means of ambulances.

Colonel Bingham, Medical Corps, the Commanding Officer of the hospital center of Paris, was informed of the general situation and instructed to organize the ambulance service to meet this need. Col. Percy L. Jones, Medical Corps, Chief of the U. S. Army Ambulance Service, with headquarters in Paris, had been communicated with, and every available ambulance in Paris was placed by him at the disposition of the A. E. F. in this emergency. For the next four days the ambulance service between Juilly and Paris was very heavy, and a considerable part of the personnel worked continuously night and day to keep the Juilly hospital evacuated. As has been shown by the statements of officers connected with this operation, at no time was there any lack of ambulance transportation, and neither was there any undue congestion of patients either at Juilly or at the Paris hospitals.

As already stated, the greatest difficulty experienced was in the shortage of personnel at the Juilly hospital. This was partially relieved by the early arrival of forty-five army nurses. The evacuation hospital which it was anticipated would arrive by June 5 did not reach Juilly until June 8. The delay was accounted for by the fact that the request for railroad transportation could not be filled by the French. On June 5 an urgent plea was made by the Assistant Chief of Staff G-4 to the Chief of the French Mission to expedite this movement. On the morning of June 6 the necessary cars were made available at Bazoilles-sur-Meuse, but owing to the congested condition of the railroads the unit did not reach Juilly until 48 hours later, or the morning of June 8. The arrival of this unit made it possible to relieve the overworked personnel at this hospital. It was also possible to detach from this unit certain of the enlisted personnel to assist the overworked personnel of the hospitals of Paris.

One newspaper critic referred to the Paris hospitals as in no sense emergency institutions and not prepared to meet such a situation as was presented. In this connection it seems desirable to state that the situation as it developed had been foreseen and that on the 8th of April, almost exactly two months before the emergency arose, the Commanding Officer of the American Red Cross Military Hospital No. 1, the Commanding Officer of the A.R.C. Military Hospital No. 2, and Major Lambert, M.R.C., attached to the Red Cross, were requested to meet the writer in Paris. On that date I informed these officers that it was my belief that at any time the hospitals of Paris might be

called upon to act as evacuation hospitals and that they could expect to receive their wounded directly from the front. Moreover, it was stated that with this contingency in view, both of these hospitals should be augmented to the maximum limit consistent with safety, and so organized that a large number of the patients could be rapidly handled and cared for. At the same time a request was made of the Red Cross (through Major Lambert), that a tent hospital of 500 beds, with a view to expansion to 1,000 beds, be made ready on the Auteuil Race Track. It might be stated also that the Red Cross began the erection of such a hospital as soon as permission from the proper authorities could be obtained, and that the hospital was ready to operate and did very materially assist in meeting the emergency which existed between June 4 and June 12. At the same time the question of automobile transportation was discussed and every possible contingency foreseen and provided for as far as available resources would permit.

Criticism has been made that the selection of Meaux as a clearing point for the wounded of the Second Division was a mistake, for the reason that it was too far from the front. I do not know who selected Meaux, but at the time it was chosen it was undoubtedly the best possible choice, for the reason that the enemy was approaching Meaux very rapidly, and to have placed the clearing point for the wounded nearer, until it was evident that the enemy could be held, would have been a most serious error. After the flow of wounded had become established, and because of the large number involved, it was impossible immediately to arrive at any other solution of the problem. However, as soon as it was evident that the enemy could be held, or about June 10, the establishment at Meaux was moved forward to La Ferte Sous Jouarre, where possession was taken of a small civil hospital. One of the Divisional Field Hospital Units was installed here and provided with surgeons, electric lights, X-ray apparatus, etc. The nearest point which hospital trains could reach for the purpose of evacuation was Coulommiers. This place had been visited several days prior by General Ireland and myself with a view to the possibility of moving hospital trains in and out. It was found that the French had no objection, as they were using the place as an evacuating point for their own wounded. The question of sending our wounded to the French Evacuation Hospital at Coulommiers was also discussed with the French authorities. We were informed that the total French resources in Coulommiers, comprising about 1,300 beds, were not adequate to meet the probable needs of the French alone. While it was stated that any Americans sent there would be given the best possible care, it was believed highly desirable that the A.E.F. establish its

own hospital. A survey of this locality showed the Chateau of Montanglaust, about two kilometers north of the city, as the most desirable site. Possession was taken of this chateau and the surrounding ground. Evacuation Hospital No. 7 was ordered to proceed there at once. At the same time, Mobile Hospital No. 1, then in Paris, was directed to proceed to Coulommiers. However, as it had no transportation, it was necessary to provide approximately thirty trucks for this purpose. The Assistant Chief of Staff G-4, General Headquarters, was communicated with and I was instructed to request the Commanding General in Paris to furnish any truck transportation which might be available. It was found that there was an ample number of trucks at the Aviation Camp a few kilometers south of Paris, but no drivers. After considerable delay, French drivers were borrowed and the unit finally started on its way. On the 12th of June both the Mobile Hospital and the Evacuation Hospital had reached Coulommiers and on the 13th were receiving patients. Within the next three weeks this formation handled over 4,000 cases, the great majority of which were evacuated by hospital train from Coulommiers. The establishment of this hospital immediately relieved the overtaxed Paris hospitals and the hospital at Juilly and at the same time reduced by nearly one-half the automobile transportation of the wounded.

As already indicated, the Medical Department found itself faced by a difficult situation when on the 2d of June it was learned that the Second Division had been shifted from the west of Paris to the northeast. At that time it was already coming in contact with the enemy and casualties were beginning to occur. Contrary to expectation, the French were able to do little or nothing toward evacuating and hospitalizing our wounded.

While it had been mutually agreed that when an A.E.F. Division was serving with the French, the latter would evacuate and hospitalize our sick and wounded, experience has shown that, for reasons which it is not necessary to detail here, the gaining control of our wounded at the earliest possible moment was so highly desirable that it must be considered a necessity. Consequently, no effort was spared to get our wounded into the A.E.F. hospitals at the first opportunity.

On June 2 the available hospital facilities which could be counted on consisted of:

Juilly Hospital of 225 beds.

A.R.C. Military Hospital No. 1, in Paris, 1,000 beds.

A.R.C. Military Hospital No. 2, in Paris, 400 beds.

A.R.C. Military Hospital No. 3, in Paris, 75 beds.

A.R.C. Military Hospital No. 5, in Paris, 500 beds.

It was necessary to provide for increasing the capacity of Juilly and the rapid evacuation of the Juilly hospital to Paris hospitals. In addition, it was necessary to provide for rapid evacuation of the Paris hospitals by hospital trains into the interior of France, where base hospitals were established. This latter movement was under the direction of Colonel Bingham, Medical Corps, and never at any time created any difficulty. Hospital trains were moved with smoothness and despatch. The increase of the capacity of the Juilly hospital was accomplished by the Red Cross. This organization, having its own transportation and ample material, was able to deliver the necessary supplies at Juilly in the course of a few hours. On account of the difficulty of transportation, the Medical Department was not prepared to bring about this result in the same length of time.

The question of evacuation of Juilly was more difficult. As already stated, insufficient personnel prevented the use of hospital trains at first and it became necessary to rely on ambulance transportation. Fortunately, ambulances in sufficient number were available, due to the fact that all of the available resources of the U. S. Army Ambulance Service were placed at our disposition. In this connection it might be well to state that in addition to the measures taken on June 2, already noted, three complete sections of the U. S. Army Ambulance Service were requested of the Chief of the Service and were immediately despatched by him to report to the Division Surgeon at Meaux.

If there was a failure to provide proper care for our wounded, then the responsibility rests entirely with the officers of the Regular Corps (Medical), as it so happened that all the planning to meet this emergency and the greater part of the execution of the measures adopted rested with officers of the Regular Medical Corps.

The value of an investigation such as the one in hand would appear to consist in the detection of mistakes made, and to learn how to correct them in the future. Whether better results could have been obtained in the present instance with the available resources is not for me to decide; but whether a similar emergency can be better met in the future is pertinent, particularly as such an emergency is apt to develop at any moment. The French have recently lost many of their best hospitals, totalling many thousands of beds. What is of greater importance, however, they have lost large quantities of material which can be replaced or by with great difficulty. Due to this loss, they are seriously hampered in meeting the needs of their own service, and they have been compelled to change their whole system of evacuation and hospitalization. It seems probable, therefore, that the A.E.F. will be forced to assume this responsibility for its own casualties. As to

whether the A.E.F. is now in a position to satisfactorily discharge this obligation, the answer must be in the negative.

In explanation of this statement the following points may be developed:

(1.) *Hospitalization*.—The number of hospitals in France is insufficient at the present time July 9, 1918, to care for the sick alone at the sick rate of last winter. The rapid arrival of troops is steadily reducing the ratio of hospital beds to the total strength of the A.E.F. In case each of the divisions now in the line should sustain one-half of the casualties which have recently occurred in the Second Division, it would require every A.E.F. hospital in France to take care of these cases and there would be nothing left for the sick.

(2.) *Personnel*.—The Sanitary personnel, as has been developed above, is insufficient. The ratio of Sanitary personnel to combat troops was fixed nearly a year ago. The figure adopted at that time was lower than that believed by the Medical Department to be necessary. In addition, the shipment of Sanitary personnel has never kept pace with the arrival of combat troops. The result is that at present there is a shortage of many thousands in the different ranks and grades. In endeavoring to meet the needs of the present situation, it is necessary to shift the personnel from point to point and in so doing to break up trained Sanitary units. This personnel shortage is urgent, has become chronic, and is now becoming acute.

(3.) *Matériel*.—The situation regarding matériel is fairly satisfactory, with the exception of automobile ambulances. The situation in this regard has become more acute, owing to the recent arrival of several divisions with no equipment for the sanitary trains. Moreover, the allowance of ambulances is inadequate. This was illustrated in the matter under investigation. The 2d division had a complete equipment of forty-one motor ambulances. In order to move the wounded, it was necessary to reenforce this number by sixty additional vehicles in order to keep the battle front cleared of wounded. Even with this very large increase it was necessary to supplement the ambulance transport by using motor trucks for the movement of the more slightly wounded patients.

Secondary evacuation from the field hospitals has to be accomplished by one ambulance company of twelve vehicles. Actually one hundred motor ambulances were required during the height of the fighting near Chateau Thierry. There was, therefore, a total of 120 ambulances serving this one division. Even with this large number, many drivers worked for 48 hours and even longer without rest or sleep.

At the present time [July 8, 1918] it is necessary to rely to a con-

siderable extent upon our ability to borrow from the French sections of the U. S. A. Ambulance Service organized for duty with the French Army. Within 48-hours the Chief of the U. S. Army Ambulance Service has received a telegraphic request from G.H.Q., A.E.F., to furnish more sections, and at the same time the French Commander-in-Chief, through the French Mission, has asked for additional sections of this ambulance service. By using all of this replacement material and personnel, the Chief of this Service will be able to furnish three sections to meet both demands, while no less than forty are needed by the A.E.F. alone.

(4.) *Transportation*.—In a situation such as the one under investigation, transportation, from the Medical Department point of view, becomes the crux of the matter. If ample transportation had been available and under the control of the Medical Department, the shortage of material and personnel would have been no serious obstacle. While, on the whole, there was excellent cooperation and a manifest desire on the part of all concerned to facilitate the care of the wounded, the fact remains that there was insufficient transportation, and none at the disposition of the Medical Department.

The difficulties and delay in securing the movement of Mobile Hospital No. 1 from Paris to Coulommiers was mentioned above. As further illustrating this point, the difficulty in moving Evacuation Hospital No. 7 to Coulommiers may be cited. This unit, with part of its property, was sent by railway train to Coulommiers. Ten carloads of its equipment were shipped direct from the Medical Supply Depot at Cosne. This shipment was ten days in reaching Coulommiers. It was urgent that this hospital should be put into operation, but as all beds and bedding were included in the Cosne shipment, nothing could be done until this shortage was made good. This was accomplished by requesting the Red Cross to furnish the supplies. Trucks were promptly sent to Paris and the necessary material was delivered at Coulommiers within a few hours. It is believed that the Medical Department, to meet emergencies of this kind satisfactorily, must be in a position to accomplish the same results.

(5.) *Red Cross*.—The Medical Department has the highest appreciation of the value of the Red Cross and the service which it can render. There is a most commendable spirit of cooperation on the part of Red Cross officials, as is shown by Major Perkins' statement. The Red Cross is considered a part of the Medical Department. There is no spirit of rivalry or competition, and all the Red Cross operations of a military nature are initiated and controlled by the Chief Surgeon, A.E.F. There are many things which by reason of having ample funds,

material and transportation, the Red Cross can accomplish more rapidly and more efficiently than is possible for the Medical Department. It is hoped that the Red Cross resources will continue to be utilized to the maximum for the advantage of the sick and wounded.

It is believed that the sphere of activity of the Red Cross should be limited to the Zone of the Rear. This belief is founded on the basic principle of military organization that only military personnel should be permitted in the Zone of Active Operations. Because of existing conditions in France, it has been necessary to make exceptions to this generally accepted rule, and Red Cross hospitals have been established well toward the front.

As illustrating the necessity for making such exceptions, the requirements of the First Division A.E.F. may be cited. When this Division went into the Line near Beauvais, the sick and wounded, in conformity with our agreement with the French, were to be sent to French hospitals in the rear of the Division. It soon became apparent that this arrangement was unsatisfactory, due largely to the difference in language and the difficulty of communication between hospital personnel and American patients. A request that the establishment of an A.E.F. Evacuation Hospital be authorized from which American patients could be evacuated by A.E.F. hospital trains was disapproved by the French. Permission was, however, secured to establish a Red Cross hospital at Beauvais. This hospital has been placed in operation. It is manned entirely by A.E.F. personnel, but a French *Medecin-Chef* is nominally in control, inasmuch as evacuation must take place by French hospital trains. Due to the congested condition of the railways, it was stated by the French that an attempt to move A.E.F. hospital trains in this area would seriously interfere with the movement of supply trains.

The result has been eminently satisfactory. Our patients are received in this militarized Red Cross hospital, cared for by A.E.F. personnel, and evacuated by French hospital trains. An agreement was made with the French Fourth Bureau whereby it was made possible to stop French hospital trains outside of Paris, remove any American patients and place them in Paris hospitals. Getting our wounded under our own control and in the care of A.E.F. personnel could have been accomplished in no other way than through the agency of the Red Cross."

ARMY MEDICAL HISTORY⁵

"The confusion created by the rapid advance of the enemy in the direction of Paris had affected the entire country, railroads probably more than other institutions, and this with the paucity of motor truck

transportation made it practically impossible to transport evacuation hospitals to the scene, or to have hospital trains approach near enough to the battle area to be of use. It had been specifically agreed in writing that American troops operating under French command should receive hospitalization at the French institutions; but the demoralization consequent upon the German advance precluded the use of these institutions, and, after triage and redressing, the seriously wounded and gassed were moved by ambulance from the field hospitals to a hospital at Juilly which was maintained by Mrs. Harry Payne Whitney for French aviators. The less severely wounded and gassed were transported by ambulance to the four Army Red Cross hospitals in Paris, over a poor road 65 kilometers in length, which added to the shock in spite of the warm weather. It was the only recourse, however, of the American command, confronted as it was at this time by insurmountable obstacles and a total lack of transportation facilities. The medical officers of these divisions performed wonders in caring for sick, gassed and wounded men; but human endeavor could not move hospitals at this period of utter demoralization and total inadequacy of transportation facilities. While some suffering was inevitable as a result of these conditions, it must be remembered that the actual conditions in war do not always admit of the nice adjustment of theories formulated in peace, and that the lesson in all this experience is additional argument that the Medical Department should have motor transportation of its own, by which its evacuation hospitals can be shifted as occasion demands.

The German advance having been stopped, desultory fighting took place daily with small resultant losses.

By dint of great effort Evacuation Hospital No. 7 was established at Chateau Montanglaust, near Coulommiers, early in June. It was joined a few days later by Mobile Hospital No. 1, both affording a bed capacity of 1,100, with good hospital train evacuation facilities; and at this time the Army Red Cross established a hospital at Jouy-sur-Morin with a capacity of 800 beds, its train evacuations being effected at

La Ferte Gauche four kilometers distant.

These hospitals with Juilly sufficed for the troops engaged at this time in the sector, and performed remarkable work.

To coordinate the control and supply of American divisions in this sector an Assistant Chief of Staff, G-4, was established at La Fertesous-Jouarre and an advanced depot placed at Lieusaint (southeast of Paris) and regulated through Le Bourget.

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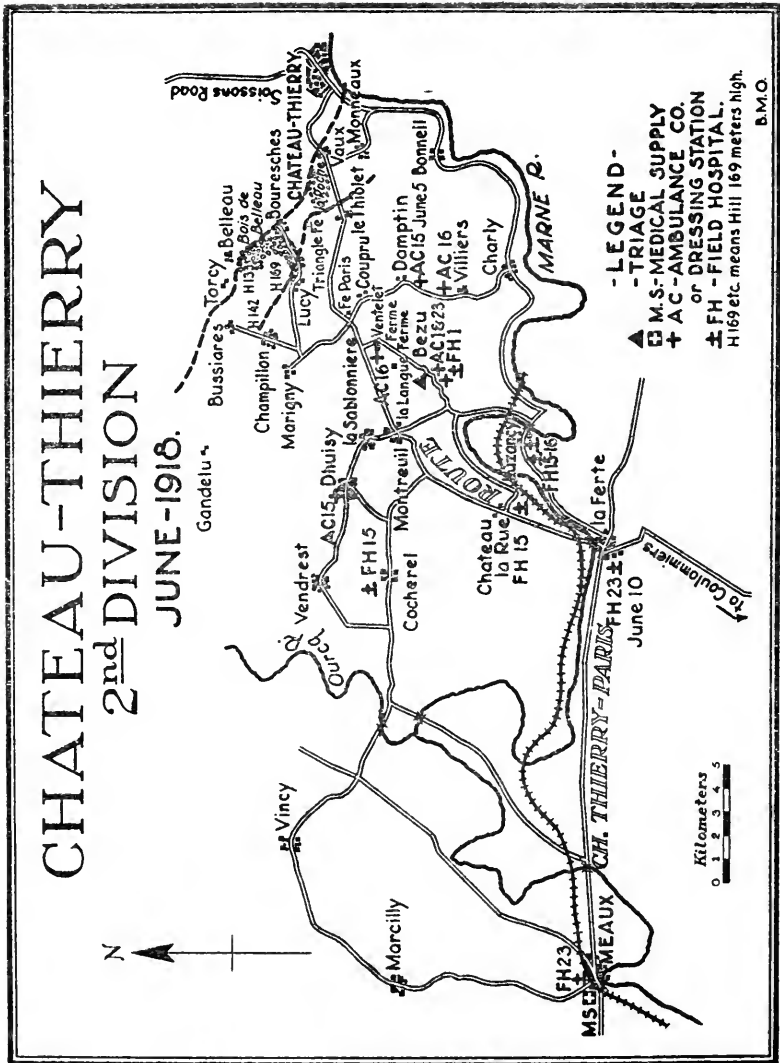
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4. Statement concerning wounded near Chateau Thierry, By Col. S. H. Wadhams, M.C., Representative of Chief Surgeon, A.E.F. at GHQ.

5. "Medical Activities in Zone of Armies," By Col. A.N. Stark, M.C., Chief Surgeon 1st Army.

MAPS.

1. Quadrillage Lambert, Scale 1/20,000, St. Aulde.
2. Quadrillage Lambert, Scale 1/20,000, Chateau Thierry.
3. Front Line, Aisne-Morne Offensive, 1/80,000, G-3, GHQ, A. E. F



PNEUMONIA FOLLOWING INFLUENZA IN THE CAMPS IN THE UNITED STATES

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PNEUMONIA with its complications was the principal cause of death during the influenza epidemic of the fall of 1918. In severity of the attack, the cases of this epidemic were rivaled only by those of the streptococcal pneumonias in some camps in 1917-1918, and when both severity and extent of the epidemic are considered, this epidemic presented a picture more terrible than this country had ever seen. Within the main period of the epidemic, September to December, 1918, there were reported, among troops in the United States, 365,827 cases of influenza and 21,070 deaths, including those from all respiratory diseases. The latter figure includes deaths from respiratory diseases which would have occurred independently of an epidemic. Other figures place the number of deaths from influenza and its complications during the last four months of 1918 at 17,700. The total cases of influenza reported for the year 1918 numbered 473,277, a figure considerably higher than those given above. It has been a matter of some debate as to how extensively influenza occurred in the camps of the United States during the first six months of 1918. Granting that the evidence indicates that numerous small epidemics did occur, these were almost invariably mild, and presented few complications, and there were few deaths. It should also be noted that the term "influenza" has been used in two ways, one to denominate the specific acute infectious disease, and the other to name a very variable symptom complex usually accompanied by fever, the cause of which may be any one of a number of infections the exact nature of which is undiscovered at the time report is made. For this reason, quite apart from the question as to whether influenza is endemic, the figures given in statistics of morbidity, from whatever source, include numbers of cases which are not influenza. In considering the pneumonias following influenza, it is therefore believed advisable to confine the data in this report to a definite period from September 1 to December 31, 1918.

MORBIDITY AND MORTALITY

In the several camps the incidence of influenza, pneumonia, and the case fatality varied, for causes not always clear. The virulence of the prevalent organisms in a given camp, and the facilities for early hospitalization of influenza patients may be mentioned among the causes which sometimes were active. The highest mortality appears to

have been that at Camp Sherman, where, of 35,100 troops, 1,073 died in 7 weeks (Vaughan). At Camp Grant there were 9,037 influenzas, about one-fourth of the command, of whom 26 per cent developed pneumonia. At Camp Meade, with 42,300 troops (Sept. 20–Oct. 20, 1918), there were 11,403 admissions with 2,877 pneumonias, of whom 763 died, an influenza incidence of 269 per thousand. The case fatality of pneumonias was 26.5 and of influenza 6.7. At Beauregard, with approximately 15,000 troops, there were 7,500 influenzas, of which 1,474 (19.6 per cent) developed pneumonia and 427 died, a pneumonia case fatality of 29. Camp Dodge had 19,041 influenzas, 2,081 pneumonias, and 747 deaths, a pneumonia case fatality of 35.8 and an influenza fatality of 6.8. Camp Custer, with 39,675 troops, had 10,728 influenzas, 2,374 pneumonias, and 674 deaths, a pneumonia fatality of 28.4 and an influenza fatality of 6.2. Other camps suffered similarly, though the proportion of pneumonia to influenza varied. From a perusal of clinical reports from the camps it is evident that the clinical basis of the diagnosis of pneumonia was not uniform, so that patients with what would be called pneumonia following influenza, in one camp, were in another held to be suffering from influenza alone. It is probable that while missed cases of pneumonia were to some extent balanced by others included with pneumonias on insufficient grounds, the high case mortalities of pneumonia in a few camps were due to the exclusion of a group of milder pneumonias the physical diagnosis of which is notoriously difficult. Likewise the case fatality of influenzas, dependent almost entirely on the total deaths from pneumonia, was subject to errors through the exclusion of many of the milder influenzas. These soldiers in times of severe stress did not report sick, and were overlooked by medical officers already burdened to the breaking point with patients severely ill. (The case fatality of influenza, based on cases reported, varied in the statistics given above between 6.2 per cent and 11.)

The clinical symptoms of influenza were in general the same throughout the camps of the United States, although there appear to have been some local differences in the virulence of the infection. The virulence of the primary influenza in any one camp seemed to vary during the course of the epidemic; in most instances the peak of virulence as expressed in terms either of severity of cases on any one day, or in terms of proportion of patients admitted who later developed pneumonia, corresponded with the numerical peak of influenza cases. (Table 1.) Certain apparent exceptions are found in some camps (e.g., Upton) in which the influenza cases showed a primary increase, then a decrease, followed quickly by a second increase. The second peak was not accompanied by a corresponding peak of complicating pneumonias

Influenza in the Camps

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TABLE 1.—Showing influenza admissions by days, the pneumonias developing therefrom, deaths by day of admission and case fatalities. (Custer).

Date	Total admissions	Total cases of and deaths from pneumonia as of days entering hospital		Pneumonia case fatality by days of admission	Duration of illness in fatal cases (average)	Total deaths by actual date of deaths
		Cases	Deaths	Per cent	Days	
Sept. 10, 1918....	29	2	1			0
11	30	1	0			0
12	31	1	1			0
13	55	1	0			0
14	34	0	0			0
15	31	0	0			0
16	40	1	0			0
17	42	3	2			0
18	34	1	0			0
19	34	1	0			0
20	67	1	0			0
21	48	2	0			0
22	25	6	1			0
23	81	20	2	10	12	0
24	89	16	3	18.7	8	0
25	169	52	4	7.7	6.2	0
26	188	43	9	20.9	7.8	0
27	260	63	16	25.4	10.4	0
28	362	85	23	27.1	9.8	1
29	536	111	33	29.7	9.3	3
30	715	107	32	29.9	10.4	1
Oct 1	871	127	53	42.2	10.3	6
2	1,129	149	57	38.2	10.5	9
3	938	165	52	31.6	11	9
4	647	132	42	31.8	10.1	11
5	755	89	31	34.8	8.	20
6	575	226	73	32.3	8.5	22
7	634	275	96	31.3	8.5	31
8	488	155	44	28.4	6.8	41
9	329	136	42	30.9	6.2	51
10	289	104	19	18.2	7.5	58
11	184	61	15	24.6	7.4	64
12	130	51	6	11.0	7.3	50
13	85	30	3	10.0	11.0	59
14	74	20	2			40
15	80	27	2			43
16	59	23	1			29
17	64	15	1			21
18	45	15	0			20
19	42	11	0			16
20	26	9	1			15
21	32	6	1			7
22	36	7	1			4
23	37	4	2			4
24	32	2	0			3
25	29	1	1			4
26	29	1	1			5
27	29	3	1			1
28	19	0	0			6
29	27	1	0			2
30	27	1	0			3
31	14	5	0			0
Nov. 1	32	1	0			0
2	23	4	0			0
3	18	1	0			3
3-30	10,728	2,374	674			674

This may have been due, among other possible factors, to improved arrangements for early hospitalization. A larger proportion of persons with low resistance may have been included among those first affected than among those who fell ill somewhat later.

The pneumonia which followed the influenza was in the main bronchial in distribution, although frequently the areas of bronchopneumonia were numerous, and closely placed, so that a large proportion of a lobe was involved, giving superficially a lobar distribution. The typical dry consolidation of pneumococcus lobar pneumonia was, however, not usually present. Some care is required in interpreting certain of the pathologic reports on this point, for while tables of findings may show a considerable number of cases reported as "lobar pneumonia," on reading the protocols it is evident that the pathologist had in mind "lobar distribution" rather than the lobar pneumonia we have been accustomed to see in the pulmonary lesion due to the pneumococcus. There were, of course, instances of typical lobar pneumonia which came to necropsy along with the prevailing bronchopneumonias. The proportion of instances in which the lungs showed lesions typical of lobar pneumonia was evidently determined by several factors, such as the type of prevailing organisms in the camp, and the time elapsing from onset of illness to death.

LENGTH OF SERVICE

The well-known difference in susceptibility to disease between the raw recruit and the more seasoned soldier, in respect to susceptibility to infectious diseases, was clearly evident in the influenza-pneumonia epidemic, as is shown by the following illustrative figures:

CAMP LEE

Length of service	Per cent of camp strength	Furnished per cent of total deaths
Less than 1 month.....	9.19	39.11
One to 3 months.....	45.18	46.24
Over 3 months.....	45.63	23.69

TABLE 2.—*The effect of length of service on the incidence of influenza and secondary pneumonia (Custer.)*

	Length of service		
	One month or under	Two months	Over two months
Approximate strength ¹	8,598	14,857	16,220
Total number of influenza cases.....	3,184	2,834	3,299
Per cent of command developing influenza.....	37	19	20.3
Total number of pneumonia cases.....	813	645	691
Per cent of command developing pneumonia.....	9.4	4.3	4.2
Per cent of influenza developing pneumonia.....	25.5	22.7	20.9
Deaths:			
Total.....	431		203
Per cent of influenza.....	7.1		6.1
Per cent of pneumonia.....		29.5	29.2
Per cent of command.....	1.8		1.2

¹ Based on weekly headquarters report of mean strength of command.

TABLE 3.—*Comparison of the incidence of secondary pneumonia in troops from the city and country: based on 8,788 cases of influenza, complicated by 2,149 pneumonia. (Custer.)*

Source	Per cent of total influenzas	Per cent of total pneumonias	Per cent influenzas developing pneumonia	Pneumonia case fatality per cent	Influenza case fatality per cent
From cities of over 10,000....	27.6	18.2	16.0	28.5	4.5
From cities and towns under 10,000.....	33.3	21.9	16.1	30.9	4.9
From rural districts ¹	39.1	59.9	37.4	28.9	10.8

¹ Patients whose occupation was farming or whose address was R. F. D.

TABLE 4.—*The influence of contact on the incidence of influenza and secondary pneumonia. (Custer.)*

Organization	Strength	Influenza		Pneumonia		Deaths	
		Number	Per cent	Number	Per cent	Number	Per cent
Total in camp.....	39,675	9,317	23.4	2,149	5.4	674	1.7
All medical and dental officers.....	164	42	25.6	9	5.5	2	1.2
All other officers.....	1,436	95	6.6	22	1.4	0	0.0
Ward men in base hospital.....	120	14	11.7	3	2.5	1	0.8
Other corps men in base hospital.....	455	57	12.0	12	2.6	7	1.5
Army nurses.....	144	44	30.6	15	10.4	2	1.4
Civilian nurses.....	121	44	36.3	8	6.6	1	0.8

EFFECT OF PREVIOUS RESIDENCE

The greater susceptibility to disease of soldiers coming from the country and small communities as compared to that of soldiers whose homes were in cities, which had been noted in epidemiologic studies of contagious diseases such as measles, was observed also to some extent in studying the epidemiology of the pneumonia following influenza. The case fatality at Camp Dix among those who came from cities of 10,000 or more was 10.8, while among those from rural homes it was 15.8. (Vaughan.) A similar relation of case fatalities was noted at Camp Devens.

At Custer (Table 3) the per cent of soldiers with influenza who later developed pneumonia was 16 in the case of those coming from cities of over 10,000, 16.1 in those from cities and towns under 10,000 and 37.4 in those whose occupation was farming, or who gave R. F. D. addresses. The case fatality of the pneumonias in each class was practically the same. There appears to be a greater resistance to infection with the organisms commonly found in the respiratory tract in the case of those who have lived in close association in the cities than in those who live in the country and are less exposed to such infections; and this relation holds when both classes suffer from a common depressant to resistance such as influenza.

The severity and, in some instances, the complications of the bronchopneumonia, appear to have been influenced by the bacteria found in the lesions; thus the staphylococcus aureus pneumonia at Camp Jackson had a very high case fatality rate, compared with other pneumonias in the same camp. At Camp Grant the prevailing organism is reported as pneumococcus; the case fatality of pneumonias was 43.

EARLY HOSPITALIZATION

The great importance of rest in bed under favorable conditions of warmth and food as a preventive of pneumonia in patients sick with influenza is well recognized, and will be referred to again under treatment, but the effect of the opposite conditions as a cause of later pneumonia in influenza deserves mention here. It was repeatedly noted that where early hospitalization was carried out in certain groups, the incidence of pneumonia was lessened, and where soldiers remained on duty while ill with influenza, pneumonia was more frequent. At Camp Devens the mortality among noncommissioned officers who remained at their posts while ill, and that of nurses, was higher than in other groups. At Camp Custer the army nurses attempted to remain on duty in the emergency even when feeling ill, and a daily inspection had to be instituted to detect slight symptoms of illness, and so prevent the

consequences of their devotion to duty, while volunteer nurses, less used to camp life, reported sick at first symptoms of illness. The incidence of pneumonia in the former was almost double that in the latter, although the army nurses were, in general, in better physical training.

It was noted that in patients who contracted influenza while in surgical or other wards of the hospitals, the incidence of pneumonia was very small. The high incidence of pneumonia among influenza patients admitted at the peak of the influenza epidemic, or shortly after, was due in part, no doubt, to the unavoidable delay in getting patients to bed. It was a common experience in many camps to find soldiers in barracks, who had been slightly ill for several days, without reporting sick, and who already showed signs of beginning pneumonia.

INFLUENCE OF INFLUENZA ON THE SUCCEEDING PNEUMONIA

While it is contemplated to limit this discussion to the pneumonias of the period of the influenza epidemic, and not to enter into an extended discussion of the pathology of influenza, it is necessary, in order to understand the clinical pathology of the pneumonias, to have in mind certain pathologic changes apparently initiated by the virus of influenza, which seem to have been independent, to some extent, of the later changes caused by the organisms found in the pneumonias. In the early hours of a typical moderately severe influenza the striking objective signs were prostration, tendency to somnolence, low blood pressure, relatively slowed pulse, flushed skin and mucous membranes with conjunctival injection, angina, and frequently epistaxis. Hemoptysis occurred early in some cases. Minute hemorrhages appeared on the mucous membranes of the mouth. Within a few hours there appeared in the fulminant cases, severe respiratory embarrassment, with cyanosis and evident edema of the lungs; at necropsy, subpleural hemorrhages and enormous edema of the lungs and pleura far overshadowed the relatively small areas of consolidation. These small areas of consolidation are quite characteristic in their peripheral location, their shallowness and frequent angularity, and their resemblance to hemorrhagic infarcts. The interlobular subpleural lymph channels are often so distended with lymph as to mark out with startling distinctness the lobular outlines, and at the bottoms of the fissures the lymph has often dissected the pleura away from the lung. In the pleural cavities a thin blood-stained fluid, from a few to one hundred cubic centimeters, practically free from fibrin, is found. Deeper within the lung tissue small hemorrhagic areas occur varying in size from 1 to 3 cm. in diameter, with a meat-like consistence resembling in texture skeletal muscle. These findings led many obser-

vers, both clinicians and pathologists, to question whether all the pulmonary changes were entirely due to the secondary invaders concerned in the pneumonias. In pneumonias dying after several days' illness with extensive though patchy consolidation, the edema might conceivably be ascribed to the secondary infection, but in the fulminant cases in which consolidation is almost insignificant in extent, and in which the entire pulmonary tissue is edematous, some other explanation seems necessary. LeCount,¹ in a report of necropsies on both soldiers and civilians, has described a necrosis of the interalveolar capillaries, in sections of the lung where there was little other change except edema of the lung tissue. The alveoli adjacent to such necrosis were sometimes filled with plasma or red blood cells. In areas where the capillary necrosis was slight some alveoli were almost free of blood cells. Associated with these capillary necroses was a necrosis of the alveolar lining epithelium which appeared early as a hyalin layer in which the outline of the separate cells was entirely lost. Close to the lining of the alveoli and ducti alveolares was seen a layer of fibrin which in its exceeding fineness contrasted with the more abundant fibrin deposit of croupous pneumonia. LeCount points out that while it might at first glance be inferred that the necrosis of capillaries and their surrounding alveolar walls was secondary to the alveolar changes, further study throws doubt on this assumption, for areas were found in which there was a widely disseminated, sharply defined focal necrosis of the minute blood vessels with very little other change except edema of the lung tissue. "This capillary necrosis suggests an explanation for a number of things such as the early hemorrhages in the lung, the escape of large amounts of fluid from the blood into the lungs, and from them into the pleural cavities, and also the 'button-like' firm peripherally located regions of consolidation compared by many observers to hemorrhagic infarcts."

The relative absence of bacteria in sections from lungs examined at this early stage is also worthy of comment. An excellent description of the lesions of the lung in influenza, which apparently are independent of the changes due to the later pneumonia, is given by Goodpasture.² He observed a "dilated condition of the alveolar ducts with a hyalin membrane partially or completely covering their walls and sometimes those of the subtended alveoli. Associated with this lesion are evidences of injury and acute reaction such as hemorrhage, edema, cellular and fluid exudate and focal necrosis of alveolar walls, each of which varies in extent in different cases."

¹ LeCount, E. R., Consulting Pathologist, U. S. P. H. S., *Journal American Medical Association*, 72, page 1519.

² E. W. Goodpasture, *American Journal Medical Sciences*, 1919, 158, page 863.

Thus it seems not unreasonable to assume that one of the chief effects of the virus of influenza is upon the vascular system and that the disease not only acts as a depressant on the resistant forces of the body, making it more susceptible to bacterial invasion, but also prepares the field by favoring capillary necrosis and edema and hemorrhage, producing changes which are visible in suitably prepared tissues. Such an hypothesis affords a working basis for the interpretation of pathologic changes observed in the later pneumonias.

BACTERIOLOGY

An immense amount of effort was devoted to the study of the bacteriology of the pneumonia that followed influenzal infection, and reports are available from many of the camps detailing the results of these studies of the sputum, throat swabs, pleural and other exudates, blood cultures, and of the tissues at necropsy. While many avenues of approach were employed, these investigations were directed at the solution of two main problems, the cause of influenza, and the immediate cause of the subsequent pneumonias.

The Pfeiffer bacillus, which previous to the epidemic of 1918 had been held by many to be the cause of influenza, was sought for at once in most of the camps, with widely divergent results. During the preceding year studies of the bacteriology of the pneumonias in several of the camps had revealed Pfeiffer bacillus in considerable numbers, in cases in which epidemic influenza was not believed to be concerned. These findings were in accord with those of many workers in previous years who had repeatedly shown that the Pfeiffer bacillus is present in many diseases such as measles, pertussis, scarlet fever, chicken pox and apparently normal throats. (Davis.) In 1918 the frequency with which Pfeiffer bacilli were cultured from patients was no doubt influenced to a considerable extent by the reaction and constituents of the culture medium used. In much of the culture work, plain blood agar was used, whereas it has since been shown by a number of investigators that blood added to the meat-infusion agar while hot (chocolate blood agar) and media containing oleates are more favorable to the growth of the Pfeiffer bacillus. But allowing for discrepancies arising from varying technique, it seems clear that the proportion of cases of pneumonia in which Pfeiffer bacilli were demonstrated differed widely in different groups and camps, and that even the most favorable methods failed in some camps to demonstrate the bacilli in greater proportions than they have been known to occur in non-epidemic periods. The bacillus of Pfeiffer usually occurred with other organisms in varying proportions, but in some cases it was predominant, and occasionally was found in

the lungs at necropsy in pure culture. Thus MacCallum found at Camp Lee, in most of the cases studied, *Pneumococcus* Type IV without Pfeiffer bacilli, while at Camp Dix, Pfeiffer bacilli were found in every case. At the Johns Hopkins Hospital similar methods, which included examination of smears from lungs and stained sections from lung, bronchi, and trachea, revealed no Pfeiffer bacilli whatever. "From these results it seems necessary to draw one or two conclusions: In certain regions or in certain communities the influenza bacillus may be so prevalent as a relatively harmless inhabitant of the throat, that when some epidemic disease, such as influenza, lowers the resistance of many persons, it becomes the natural secondary invader capable of producing pneumonia. This might be regarded as the endemic occurrence of a potential cause of pneumonia. On the other hand, it has been shown that a simple carrier of the hemolytic streptococcus, when introduced into a hospital full of patients with measles, may be the source of an epidemic of streptococcus pneumonia. It seems quite probable that secondary infection with the influenza bacillus with the production of pneumonia may, in the same way, have a local epidemic character. No satisfactory evidence has been brought forward to show that the epidemic disease influenza is a bacterial infection." (MacCallum.) In some of the camps, especially the Eastern, the Pfeiffer bacillus was found in influenza and pneumonia in very high percentages of the cases, while in other camps, such as Custer, and others where special search was made, this bacillus was found in a relatively small per cent of cases. This irregularity of distribution was not peculiar to the Pfeiffer bacillus, but was noted with respect to the other organisms commonly found in the pneumonias of this period, for as will appear later, in one camp the streptococcus, in another the pneumococcus, was the prevailing organism. Such observations of themselves throw grave doubt on the assumption that the Pfeiffer bacillus is the cause of influenza, and when the negative results of attempts to produce influenza by inoculation with Pfeiffer bacillus, and the clinical features of influenza itself which resemble those of the exanthemata much more closely than those of a bacterial disease are considered, the case for the Pfeiffer bacillus as the cause of influenza appears to be extremely weak.

In a survey of the exhaustive reports from a number of camps, perhaps the most striking feature is the diversity bacteriological findings with respect to the incidence not only of the Pfeiffer bacillus but also of other organisms such as the pneumococcus, streptococcus, or staphylococcus, in the sputum, blood, lungs, and other tissues of patients ill with influenza and pneumonia. Furthermore, in the same camp the proportions of incidence of the several organisms varied during the progress of the epidemic. Thus at Custer it was noted during the

epidemic that whereas pneumococci occurred as infecting agents in about one-third of the early cases, they gradually gave way to hemolytic streptococci, and eventually disappeared almost entirely, so that during January and February, 1919, the pneumococcus was isolated as the presumable cause of disease only three times. (Blanton.) Difference between camps with respect to the prevailing types of organisms was not peculiar to the period of the influenza epidemic. Variations in the incidence of organisms in different camps was repeatedly noted in reports during the previous year, notably in studies of lobar pneumonia.

TYPES OF PNEUMOCOCCUS REPORTED IN CAMPS TO MARCH 1, 1918

Type	Grant	Taylor	Sherman
I	7	28	25
II	13	18	10
III	8	0	2
IV	80	48	33

At Camp Grant to March 1, 1918, Type III pneumococcus had been isolated in eight cases, but in no cases at Camp Taylor. At Custer no Type I pneumococci were encountered until April, 1918, when there was one case. With the arrival in April of 2,000 Alabama negro troops, Type I pneumonias began to appear. Seventeen cases of Type I pneumonia developed in two barracks in these troops, and eight other cases in the camp. Other examples might be cited which indicate that the incidence of the several organisms varied in the different camps, and also varied from season to season in a given camp. This was shown in the examination of the throats of the supposedly healthy as well as the sick. Change of invasive power or virulence of the organisms prevalent in one camp or group seems evident from the increase in case fatality, as will appear later.

In view of the foregoing facts, the most satisfactory hypothesis as to the etiology of the pneumonias of the influenza epidemic appears to be that they were caused by such bacteria with potential pathogenic power as happened to be resident in the throats and upper respiratory passages of the victims of influenza, or in case such bacteria were not originally present, then by transfer from those already suffering from pneumonia to the hitherto uninfected influenza patients. Influenza produced the same clinical picture everywhere, and like measles or other depressant diseases or conditions, reduced the resistance of the patients so that the secondary invaders, whether streptococcus or pneumococcus or Pfeiffer bacillus, were able to gain a lodgment in the lung, and produce a highly fatal type of pneumonia. With this conception of the single depressant, influenza, as the primary cause, followed by secondary infections by such organisms with potential pathogenic power as might be present in the respiratory tract, the somewhat

diverse findings in the different camps over the country may be brought into an orderly and understandable relation with each other, to form the larger complex of the whole epidemic. Differences in case fatality are referable in part possibly to variation in the severity of the primary depressant, in its passages from person to person, first gaining rapidly both in prevalence, depressant action, and severity of pulmonary lesion and then decreasing in prevalence and severity, as evidenced in some camps by a study of the degree of illness of successive groups of those who fell ill at the onset of the epidemic, during its height, and during its decline, and who did not subsequently develop clinically evident pneumonia. The virulence or invasive power of the secondary invaders also affected the case fatality, both in different camps, and in the same camp during the progress of the epidemic. Other more individual factors possibly exerted an influence on the incidence and outcome of the disease as well as immunity derived from previous exposure to influenza earlier in the year.

A complete bacteriologic study of all cases of pneumonia in the camps during the epidemic while perhaps desirable had it been possible, was entirely out of the question. Most of the larger camps had from 5,000 to 10,000 cases of influenza with from 1,500 to 2,500 or more cases of pneumonia, and daily hospital admissions of 200 to 1,000 or more patients per day during the period of the epidemic. The number and comprehensive character of the laboratory reports made by the chiefs of laboratory service and their assistants upon material gathered under such pressure and trying circumstances is a monument to the devotion of these men and women to the medical and scientific service of the Army. It is not proposed in this summary to enumerate all of the many excellent laboratory reports, or to discriminate by reference to some and not to others. They will all, no doubt, appear elsewhere in these records. Reference will be made to some for the illustration of clinical points, particularly those with which the writer is more familiar.

PATHOLOGY

The pathology of the pneumonias which followed influenza was thus modified by (1) the effects of the preceding influenza itself which depressed the general resistance of the patient, and at the same time prepared the pulmonary tissues for secondary invasion by producing capillary thrombosis and alveolar changes with necrosis; (2) by the duration of illness before death, (3) by the type of secondary invasion.

In patients who died early in their illness the pulmonary changes clearly attributable to the pneumonia were often limited, and far overshadowed by the widespread edema which appears to have been due,

to a large extent, to the initial influenzal virus. While such acute rapidly fatal cases occurred throughout the epidemic, they were most numerous at the height of the epidemic in any one camp. It can be shown, however, that among the admissions at the height of the epidemic were a number of patients who died at a later period, and in whom the pathology corresponded with that commonly seen in the later portions of the epidemic.

While the pneumonias presented certain features in common whether produced by streptococcus, staphylococcus, pneumococcus, Pfeiffer bacillus, or other organisms, there were also differences of pathology to be made out in the lesions produced by each infection. The following descriptions are quoted from an article by MacCallum.³

TYPES OF PNEUMONIA

In persons who have just passed through an attack of influenza, the following types of pneumonia may be recognized, although it is evident that the distinctions may be rendered indefinite by the simultaneous infection with other organisms: Pneumonia caused by (1) the pneumococcus; (2) the staphylococcus; (3) the streptococcus, (4) bacillus of Pfeiffer.

Pneumococcal Pneumonia.—When the pneumococcus occurs in pure culture, and also in those cases in which it is the predominant organism even in the presence of influenza bacilli and other organisms, a characteristic form of pneumonia is produced under the conditions of lowered resistance. In most instances there is very little fluid found in the pleural cavity, and the surface, instead of being covered with a shaggy exudate of fibrin, is only slightly dulled. There are brick-red paintlike patches here and there, and sometimes small, elevated, grayish yellow flecks which become fluent in patches. The pleura and interlobular septums and remaining framework of the lung appear to be unchanged. The bronchi are not especially conspicuous. Their walls are not thickened, and while they may sometimes contain, in the later stages, fibrinous moulds, they are usually empty or partly filled with a thin, brownish or blood-stained, frothy fluid. Their mucosa shows no marked alteration from normal. The blood vessels are normal.

On external inspection of the lung, it is frequently possible to recognize sharply outlined consolidated lobules alternating with air-containing and atelectatic lobules. The lobular character of the consolidation is in these cases well marked, although it tends to lose its definiteness through the confluence of adjacent areas. No general statement can be made as to the location of the consolidation, but it usually affects

³ MacCallum, W. G., *Journal American Medical Association*, 72, page 720, 1919.

the posterior and lower part of each lobe, and the posterior part of the lower lobe is especially frequently involved.

The cut surface of the lung shows, in the more acute cases, a peculiar lobular or confluent consolidation which corresponds well with what is commonly written of the stage of engorgement in the description of lobar pneumonia. Bronchioles, blood vessels and the framework of the lung are not appreciably altered. The substance of the lung is firm, elastic, and not rigid as in later stages; but it pits on pressure, exuding a great quantity of blood or brownish blood-stained fluid. The surface is smooth, moist, slightly elevated above the surrounding tissue, grayish red or brownish red and coarsely spongy. Distinct but minute depressions can be seen everywhere, filled with a translucent, gelatinous fluid. These are too large to be the cavities of the alveoli and are separated by what appear to be thick walls of homogeneous tissue. They are, in fact, the widened ductuli alveolares filled with fluid and separated by areas of alveoli filled with a somewhat firmer exudate. No visible or palpable plugs of exudate project from any part of the surface, and there is nothing of the roughness that this produces in the later stages. Nevertheless, the consolidated tissue is easily distinguished from that surrounding it, because it has lost the satiny texture of the normal lung, which may be pulled this way and that, like silk gauze. In the area of pneumonia, despite its smoothness and moist, rather translucent, surface, the distended form of the meshes is maintained.

Microscopically these areas show an extraordinary dilatation of the ductuli alveolares, which are filled with clear fluid containing only a few leucocytes and a delicate coagulum. They are lined with a curious hyaline substance which begins in a layer overlying the cylindric epithelium in the terminal part of the bronchiole and often runs over the orifices of the atriums or enters them and extends toward the air sacs. It does not give the reactions of the fibrin. The alveoli contain an exudate of fluid with a few leucocytes and mononuclear cells, often overshadowed by great numbers of well-preserved red corpuscles. These cells are held together by the most delicate, filmy network of fibrin. Great numbers of pneumococci are scattered throughout the exudate. The alveolar walls maintain their normal appearance.

Later stages in pneumonia show within these areas patches of rough, gray, consolidated tissue, from which definite plugs of exudate project. Every transitional stage may be found, up to the most advanced labor consolidation, with dense gray hepatization.

Streptococcal Pneumonia.—When streptococcus hemolyticus occurs alone in these cases, the lesion produced is practically identical with

that described as "lobular pneumonia" in certain cases of the previous epidemic of 1918. There is not necessarily extensive pleural effusion, but the pleura may contain a small amount of bloodstained fluid. The interlobular septums are endematous, and the bronchial walls are slightly thickened. The area of consolidation is indefinitely outlined, and in places it is deep red or almost black, evidently as the result of laking blood.

Microscopically the bronchi and alveoli are packed with leucocytes, blood, and fibrin, and loaded with tangled masses of streptococci. Much of the blood is laked and appears in the form of shadows. Much of it again is coalescent into beaded network of pink-staining hyaline material. The capillaries in the alveolar walls are plugged in many places with hyaline fibrinous thrombi, and a similar hyaline material is found in the walls of the larger blood vessels. The bronchial walls are infiltrated with leucocytes, and the epithelium is lifted up or destroyed. Whole areas of the lung, although retaining their form, are entirely necrotic, the alveolar cavities being packed with almost solid masses of streptococci. Lymphatics are everywhere distended with exudate containing enormous numbers of streptococci. In none of these cases was there enough resistance to give time for the development of an interstitial bronchopneumonia.

Pneumonia Produced by Bacillus of Pfeiffer.—In two cases at Camp Dix the influenza bacillus was present in pure culture, and in others it was the predominant organism. Tissues from another case in which the influenza bacillus occurred alone were sent from Camp Jackson. It is easy to recognize the type of pneumonia produced by this organism, since it is fundamentally different from the others.

There is no abundant pleural exudate, although the pleural surface may be covered with fibrin or with old adhesions. The bronchi exude a thick yellow pus, and the bronchial glands are moderately enlarged.

On section, the lung is found to be in large part air-containing, but it is studded throughout with palpable shotlike nodules or with somewhat larger patches of firm consistency. The cut surface of these nodules is very smooth, and they are grayish yellow. They are seen to be peribronchial, so that when they stand alone the center is occupied by the lumen of the bronchiole. The remaining lung substance is air-containing or indurated or grayish.

Microscopically it is found that the bronchi are filled with an exudate of leucocytes, among which numerous influenza bacilli are lying, sometimes in clumps and scattered freely, but most often enclosed in phagocytic cells. The wall of the bronchus is greatly thickened by infiltration of mononuclear cells with a few leucocytes, and by the new formation of

connective tissue cells. The alveolar walls for considerable distance about this are similarly thickened, infiltrated, and indurated. The alveoli contain an exudate which is usually rich in leucocytes, but which is often predominantly composed of desquamated epithelial cells and dense fibrin. In this exudate it is rarely possible to find influenza bacilli. Organization is advancing rapidly, and in many instances it has completely replaced the fibrinous exudate with fibrous tissue over which epithelial cells have grown.

The lymphatic channels in the bronchial walls and the widened interlobular septums are inconspicuous, and none are found distended with exudate. There is no intense infection of the pleura or great outpouring of exudate. These two facts, together with the relatively inconspicuous part played by the polymorphonuclear leucocytes in the alveolar exudate, and the exudate infiltrating the walls of the bronchi and alveoli, are all that distinguish this pulmonary change from the interstitial bronchopneumonia caused by the hemolytic streptococcus. The sharp contrast between this form and those produced by the pneumococcus and streptococcus is very evident.

In describing the forms of pneumonia caused by the hemolytic streptococcus, it was shown that the interstitial bronchopneumonia was produced when the organisms encountered high resistance, through which the tissues succeeded in barricading themselves against invasion and repressing the multiplication of the bacteria, but that with a lapse in the powers of resistance there might be produced in the same case areas of lobular pneumonia in which an exudate of leucocytes filled the alveoli. In this exudate the streptococci multiplied with great rapidity.

In the case of the influenza bacillus an exactly analogous condition exists. There are cases in which an interstitial bronchopneumonia has developed, with restriction of the bacilli to the bronchial exudate, but in which later, probably with lowering of the resistance, other lesions presenting the character of lobular pneumonia have arisen in which the more distant alveoli are packed with leucocytes with abundant influenza bacilli.

Pneumonia associated with staphylococcus aureus was noted and described at Camp Jackson.⁴ The surface of the affected portions of the lung is deep purplish blue, and on the cut surface, in addition to petechiae, there are small yellowish white spots, pinhead in size, situated just beneath the pleura, which prove to be minute abscesses, ranging in size from 1 to 10 mm. Nine of the fourteen cases examined showed these small abscesses. Of the cases not showing abscess formation, three were very early, the patients dying on the fourth, sixth, and seventh

⁴ Chickering and Park, *Journal American Medical Association*, 72, page 617, 1919

days from the onset of the primary infection. The majority of the abscesses tend to be situated at the periphery of the lung near the pleura, though the whole lung may be involved. Three necropsies revealed the presence of a suppurative pleuritis; in one the pus was in the lower part of the left pleural cavity, in another in both pleural cavities, one of the pockets situated in the upper part of the left anterior chest communicated with the pericardium. There were four cases of pericarditis and one of acute vegetative endocarditis. Where two or more organisms were concerned in the pneumonias, or where infection by one organism was followed by a superimposed second infection, the types of pulmonary lesions were modified, and became less characteristic.

The differences between camps in respect to the prevailing secondary invaders no doubt accounted for differences in the pathology noted in some reports, and for the same reason the pathology in any one camp was altered as the type of prevailing organism changed. Early in the epidemic in most of the camps, extrapulmonary lesions were unusual, and empyema rare; but in exceptional camps, where hemolytic streptococcus prevailed from the onset, purulent pleuritis were frequent throughout the course of the epidemic. (Dodge.)

SYMPTOMATOLOGY AND COURSE

Pneumonia followed influenza either directly without any period of improvement, or after a remission in fever, or still later, after convalescence from influenza seemed to be established. At the height of the epidemic, when the influenzal infection itself was severe, patients entered the hospitals after but a few hours illness already cyanotic, with fever, dyspnea, and physical signs of acute pulmonary edema and died, within 1 to 3 days, a distinctly respiratory death. In other cases, equally acute in onset, pulmonary edema was less extensive, at the onset, and after a somewhat more prolonged course, death occurred on the fourth, fifth, or sixth day, with the physical signs of consolidation more marked. Still other patients, in whom the pneumonia followed directly on the influenza, showed a greater resistance and either finally recovered or succumbed later to complications. Many of the pneumonias which followed influenza after a period of temporary improvement were also fatal, but the case fatality of these was not quite so high as that of the severe fulminant class. While the fulminant rapidly fatal cases attracted special attention by reason of their severity, they did not constitute the majority of pneumonias of any one day's admissions, as will appear from Table 1 in which duration of illness was averaged for the fatal pneumonias, arranged by day of admissions. The early deaths were balanced on each day by other more

delayed deaths so that the average duration of illness varied between eight and eleven days. The apparent decrease in duration of illness in the latter half of the severe portion of the epidemic is believed to be accounted for by a considerable number of patients who reported sick only after pneumonia had supervened upon influenza, and whose days of primary illness do not appear in the records. The proportion of such cases no doubt varied in different camps, depending upon how severely regimental routine of inspection was overtaxed.

There were few extrapulmonary complications noted either clinically or at necropsy in the more acute cases, apparently because the patients succumbed to the virulent infection before complications had time to develop, but as the epidemic progressed beyond the peak, the period of illness before death increased, and extrapulmonary complications became more numerous.

Tabulation of 939 carefully studied non-fatal cases of pneumonia uncomplicated by empyema, at Camp Custer, show an average period of 2.9 days from admission to the hospital to onset of pneumonia, and an average duration of 8.4 days pneumonia before defervescence. These patients were held in their wards for a further average period of 7.8 days before transfer to a convalescent ward, where they were given graduated exercise for a further average period of 19.7 days, before being returned to their organizations.

The onset of pneumonia was frequently insidious, being marked only by the continuance of fever of the initial influenza beyond the usual period, or by increase in respiratory symptoms such as cough, increasing cyanosis, rapidity of respirations, dyspnea, or only by an increase in general ill appearance of the patient. Physical signs of consolidation such as dullness, marked changes in breath sounds, and localized areas of rales often appeared late, long after it was apparent from the general appearance that a severe pulmonary infection had supervened. To formulate any definite group of symptoms or signs on which the diagnosis should depend was clearly futile, for there were numerous exceptions, and a multitude of combinations of symptoms and physical signs. The physical signs of greatest constancy, and therefore value, in the early diagnosis of pneumonia were increased vocal transmission, with or without bronchial breathing, groups of fine rales specially excited by coughing, and the intensification of normal breath sounds with or without the addition of bronchial or bronchovesicular quality. (Upton.) Such findings appeared in small areas, and the early diagnosis was made on slight variations from the normal which slowly became more pronounced, and later could be confirmed by the development of unmistakable signs of pneumonia.

Two cases may be cited in which the findings were similar and

slight as noted above, for a period of three or four days. At this point the first patient died, while the second developed thereafter clearly marked signs of consolidation. In the fatal case, several observers questioned the diagnosis of bronchopneumonia all lobes; necropsy, however, showed a general distribution of small areas of consolidation confluent in numerous places to make areas in size from 1 to 3 cm. in diameter. None of the larger areas were at the surface and emphysematous lung was evident between the involved areas. (Custer.)

In some cases, particularly those in which the influenza was severe with symptoms of pulmonary disease rapidly supervening, the pulmonary edema, with accompanying diffusely distributed rales, made it doubly difficult to anticipate at what precise spots pneumonic consolidation was developing. Often the necropsy showed multiple areas, as in the case just cited. While it is true that necropsy rarely, or never in some series, failed to show some areas of consolidation on which to base a diagnosis of bronchopneumonia, the involved areas were sometimes so small and few as hardly to furnish of themselves alone an adequate cause of death; in such cases the extensive pulmonary edema and toxemia appeared to be the determining factors.

FEVER

Fever varied from 100 to 104, sometimes higher, usually with slight daily remissions. Defervescence was usually by lysis, though there were numerous instances of critical drops in temperature with subsequent complete convalescence. The pulse varied much with the individual case, but the relatively slow pulse seen in many influenzas, sometimes continued for the early days of supervening pneumonia, later becoming more rapid.

Nosebleed and bloody expectoration, which occurred in many of the influenzas persisted during the later pneumonia, and it was held by many observers that patients showing early hemorrhages in influenza were likely to develop severe and often fatal pneumonia. This was apparently another way of saying that those patients in whom there were extensive vascular lesions in the respiratory tract were thereby more susceptible to severe secondary pulmonary infection.

LEUCOCYTES

The leucopenia of influenza often persisted when pneumonia developed, Table 5 shows the relative absence of leucocytosis in influenza and subsequent pneumonias. The failure of leucocytic response when pneumonia supervened upon influenza is evidently so frequent that the presence or absence of leucocytosis in suspected pneumonia offers but little aid in diagnosis. From the point of view of immunity, also,

the behavior of the leucocytes in influenza is of interest, for not only were they not regularly increased in numbers but they were relatively inactive as regards phagocytosis, no matter with what organisms or sera this property was studied. (Tunncliffe.)

TABLE 5.—*Results of 1,580 Leucocyte Counts made before and after the Development of Pneumonia. (Custer.)*

Leucocytes per c.mm.	Prepneumonia stage		Pneumonia	
	No. of cases	Per cent	No. of cases	Per cent
4,000– 6,000.....	96	16.5	288	28.8
6,000– 8,000.....	306	52.7	390	39.0
8,000–12,000.....	113	19.5	177	17.7
12,000–16,000.....	48	8.3	83	8.3
16,000–20,000.....	14	2.5	29	2.9
20,000–30,000.....	3	0.5	33	3.3
Totals.....	580	.....	1,000	.....
Differential Counts: Occurrence of polymorphonuclear leucocytes: Per cent				
40–50.....	6	2.6	35	3.5
50–60.....	40	17.4	112	11.2
60–70.....	60	26.0	260	26.0
70–80.....	97	42.2	459	45.9
80–90.....	27	11.8	134	13.4
Totals.....	230	.....	1,000	.....

SPUTUM

Sputum varied in amount and color just as in the cases in other groups of pneumonia. Sometimes sputum was scant or absent. The usual type of sputum was muco-purulent, grayish yellow in color, often blood streaked, and a considerable number were described as rusty. At times sputum was more bloody, and in some cases consisted of almost pure blood. At Custer an attempt was made to trace some relation between the type of sputum and the organism recovered from the sputum during life and from the lungs post mortem. Rusty sputa were got as often in cases of streptococcus as pneumococcus infection and the muco-purulent occurred as often with one organism as another. In 1,015 sputa examined and typed, streptococci preponderated, non-hemolytic 70 per cent, hemolytic, 30 per cent, Type IV pneumococcus was found 172 times, and other pneumococci relatively

less frequently. The Pfeiffer bacillus was identified in 33 instances in only 8 of which it occurred alone. (Blanton.)

On the other hand, there was noted in some instances a relation between the type of sputum and the prevailing organism of pneumonia. In camps in which Pfeiffer bacilli were frequent, the sputa were noted as having the greenish yellow, tenacious character commonly attributed to infection with this organism. At Jackson, where many cases of staphylococcus aureus pneumonias were studied, the sputum in this type of infection was described as "friable," purulent material of dirty salmon pink resembling anchovy sauce, or the contents of an overripe furuncle. "One can almost give a fatal prognosis when such sputum is obtained."

Mathers, working at Camp Meade, isolated a green-producing streptococcus from the sputum in 87 per cent of 110 cases of influenza and pneumonia on the first and second days of the disease. This gram positive coccus produced large green flat moist colonies on blood agar, was not agglutinated by type pneumococcus sera, and was virulent for laboratory animals such as mice. Further studies have indicated that this coccus occurred in a number of camps as far west as California. (Tunncliffe.)

TABLE 6.—*Bacteriologic Findings at Necropsy from the Lungs and Heart's Blood of Pneumonias Patients. (Custer)*

	No. recovered from lungs	No. recovered from heart's blood
Pneumococcus.....	78	77
Type 1.....	8	6
Type 2.....	34	33
Type 3.....	18	16
Type 4.....	18	22
Streptococcus.....	142	110
Hemolytic.....	76	62
Nonhemolytic.....	66	48
Pfeiffer bacillus.....	8	3
Unsatisfactory.....	30	29
Sterile.....	22	86

Much difficulty was experienced by a number of laboratory workers in classifying some of the atypical organisms isolated during the epidemic and it is likely that these diplococci of Mathers were classified as a typical pneumococci in some reports, and in others as non-hemolytic streptococci.

BLOOD CULTURES

Numerous excellent reports are available in which many hundreds of blood cultures were made at all stages of pneumonia. As compared with results in lobar pneumonia, the number of positive cultures was remarkably small. Thus one camp (Custer) (Table 6) reports 510 blood cultures with 11 positive (10 hemolytic streptococcus and 1 pneumococcus mucosus). At another camp in which pneumococci were the prevailing secondary invaders, 11 per cent positive (pneumococcus) of 178 cultures. The increased per cent of positive cultures when taken shortly before death, and the still higher proportion of positive results obtained in post-mortem examinations of heart's blood, indicate that the bacteremia represented usually a terminal invasion. The rarity with which the Pfeiffer bacillus was found in blood cultures, even in camps in which it occurred frequently in the secretions of the respiratory tract, may be noted in connection with the assumption by some of its etiological relation to influenza. In patients who died after more prolonged pneumonia, or who suffered from tedious complications, positive blood cultures were more frequent, and in these cases the streptococcus was most frequently isolated.

DIAGNOSIS

As might be expected in a disease presenting so many clinical variations, there were, in addition to the great group of clearly marked bronchopneumonias, a considerable number of cases which occupied the border zone between influenza and pneumonia, whose disposition as regards diagnosis depended somewhat upon the personal opinions of officers in each camp. In the presence of widespread edema, and with the areas of consolidation remote from the chest wall, it was often a matter of great difficulty clearly to demonstrate the precise areas of pneumonia. Even when time was available for adequate study, there were often great differences of opinion as to the presence or absence and the location of the pneumonia. The signs of consolidation often developed slowly, and it was a common experience in the necropsy room to find multiple areas of consolidation much more extensive than had been suspected from physical examination. Simultaneous involvement of several or all lobes was frequent, and successive involvement of all lobes was more rarely seen than in the streptococcal pneumonias of the previous winter. The occurrence of a number of closely placed foci of pneumonia with their rapid fusion produced at times a lobar distribution which, in some camps, especially where cases of true lobar pneumonia were occurring, caused some confusion in diagnosis. The value of the post-mortem examination in correcting erroneous interpretations of physical signs of a disease complex which was entirely new to many officers cannot be overestimated.

The fluoroscope and radiogram were of great value in detecting areas of consolidation and of accumulations of fluid. Radiograms were specially valuable in view of the paucity of definite physical signs and frequently revealed areas of consolidation of an extent unsuspected by the examining physician. The use of the X-ray was, however, a two-edged sword in that such examinations necessitated usually transportation of the patient for some distance, and it was soon recognized that unnecessary moving was often extremely detrimental to the patient. In the more chronic cases where fluid was suspected but not successfully demonstrated by the exploring needle, the X-ray was of great assistance. Increase of leucocytes after the period of leucopenia, of influenza, was of some help in indicating the development of pneumonia, but inferences drawn from this source in the individual cases were limited by the fact that in many instances leucopenia persisted throughout the pneumonia.

From the study of the clinical features of the less fulminant pneumonias, it was possible to draw certain guarded conclusions as to the probable nature of the principal secondary invader. Thus the sputum of pneumonia due to the Pfeiffer bacillus was frequently greenish, and tenacious, while the sputum of staphylococcus pneumonia was described as a characteristic reddish friable material resembling anchovy sauce. Rapidly developing seropurulent effusions were more often seen in the streptococcal pneumonias.

COMPLICATIONS

It is generally agreed that necropsies on patients who died at the height of the epidemic disclosed relatively few extrapulmonary complications, and that later in the epidemic, complications became more frequent both clinically and at necropsy. That the severity of the pulmonary involvement, both primary influenzal and supervening bacterial infection, produced death at an early stage of the disease before invasion of the other organs could develop is the obvious explanation of the early absence of complications. Another factor which has perhaps not received sufficient emphasis in this connection is the element of individual resistance, for if mortality figures are analyzed by day of admission to hospital instead of by actual day of death, it will be found that many of those who died later with numerous complications were actually admitted at the height of the epidemic, and constitute that portion of the total admissions who were sufficiently resistant to withstand the infection immediately fatal to others, but whose resistant powers were inadequate for final convalescence.

PLEURISY AND EMPYEMA

Although pleurisy was frequent, and empyema occurred in a number of cases, these complications were by no means so frequent as in the streptococcal epidemic of 1917-1918 in which as high as 50 per cent of pneumonias in some groups developed empyema. In 150 autopsies at Custer, there were 44 (29.3 per cent) in which there was no evidence of pleurisy. Of 97 cases with pleural exudates found antemortem up to November 30, 1918, the fluid was sterile in 25, contained streptococcus in 53, (42 hemolytic), pneumococcus in 17. A total of 106 cases of empyema, (2374 cases pneumonia) were found during life. Of these, 24 died within 36 hours from the accompanying pneumonia. Seven other undetected empyemas were found at necropsies performed in about 20 per cent of deaths. Assuming the same proportion of missed empyemas in the cases not examined post mortem, the total number of empyemas would be about 140, among 2374 pneumonias.

In most of the camps it was felt that the relative infrequency of empyema as compared with the streptococcus epidemic of 1917-1918 was ascribable in part to the acute course and early death of patients at the height of the epidemic before sufficient time had elapsed for the development of empyema. It was also noted that toward the end of the epidemic, streptococcal infections became more frequent in some camps, with a corresponding increase in the number of empyemas. At Camp Dodge there were something over 159 cases of empyema in approximately 2100 pneumonias; the streptococcus predominated here, the clinical course was much more fulminant than in other camps, and in this respect approximated the type of infection seen in the winter 1917-1918.

Empyema is thoroughly discussed elsewhere in these reports, and reference to its pathology and treatment are therefore not repeated here. It may be noted however that results in general indicated the desirability of delay in operation with repeated aspirations until the fluid became thick, adhesions had time to form and the accompanying pneumonia to subside, and the necessity of producing at operation a minimum of pneumothorax, thoracotomy with insertion of closed catheter drainage being frequently the operation of choice, at least for the first operation.

Interlobar empyema, and localized areas of fluid, usually pus, were found in many of the more chronic cases; the fluoroscope and radiograms were of great assistance in detecting these areas. Pneumothorax was seen in a few instances, and was ascribed to rupture of emphysematous air vesicles or rupture of a softened area of infarction.

OTHER PULMONARY COMPLICATIONS

Lung abscess and gangrene occurred occasionally in the more chronic cases. In those which died relatively early there were found multiple small pulmonary abscesses. This was specially true of the pneumonias due to staphylococcus aureus. Streptococcal pneumonias also frequently showed multiple areas of softening throughout the lung tissue with abscess formation.

Tuberculosis as a sequel of influenza and pneumonia was encountered only rarely, somewhat to the surprise of many medical officers, who had anticipated a considerable incidence of tuberculosis in the wake of the epidemic. Among the factors which no doubt decreased the incidence of tuberculous sequelae was the previous careful examination of recruits for tuberculosis, with the production of a selected population in which incipient tuberculosis was less than in civil life. While admissions for tuberculosis for the late months of 1918 declined sharply instead of rising in the camps, the obvious cause for this decline was the cessation of induction of new troops.

HEART

Pericarditis and endocarditis were met occasionally, usually in more chronic cases. At necropsy acute sero-fibrinous pericarditis was found 3 times in 140 necropsies. (Custer.) At Fort McHenry pericarditis was found 19 times and chronic vegetative endocarditis 4 times in 104 necropsies. At Dodge pericarditis was observed in 9 out of 53 necropsies made during the early portion of the epidemic, and in 20 of 69 necropsies made during the later portion of the epidemic. Seventeen (or 59 per cent) occurred in patients dying after 14 days' illness. The average duration of illness was 35 days. In the majority of cases the pericarditis was regarded as an extension by continuity from other mediastinal suppuration and empyema. Vegetative endocarditis was occasionally met with at necropsy in patients dying after several weeks' illness.

Aside from the lesions directly related to the infection, cardiac complications were not frequent except as a terminal event, probably by reason of the fact that the patients were a specially selected group of healthy young adults. In convalescence however the severe strain to which the heart had been subjected became evident in persistent tachycardia and cardiac irritability. Very slight exertion in apparently robust convalescents served to produce rapid heart action in many cases, and it was found that the pulse rate was the best index for gauging the amount of exercise to be undertaken by the convalescent soldier. With care as to exercise, and prolonged rest, the heart rapidly regained its normal tone even in severe cases, and instances of evident permanent cardiac disability were rare.

INTERSTITIAL SUBCUTANEOUS EMPHYSEMA

Subcutaneous emphysema becoming evident first at the neck and extending upward over the face and head, and down over the trunk to the groin, was observed and described in a number of camps, and presented a striking clinical picture. Such patients usually died although recoveries were sometimes noted. At Jackson there were 6 cases in 1,400 pneumonias, two of which were associated with staphylococcus aureus pneumonia. At Dix 20 cases were reported; of 12 cases more fully studied, 3 recovered. Beauregard reported 10 cases in 1,474 pneumonias with 2 recoveries. At Fort McHenry subcutaneous emphysema was found in 2 of 104 necropsies. At Custer there were 10 cases in 2,374 pneumonias.

The origin of the emphysema was not always clear at necropsy, but in those cases in which conclusions seemed warranted, appeared to be the result of rupture of air vesicles at the root of the lung, with continued escape of air first into the mediastinal tissues, and thence upward into the neck. The extent of emphysema varied, in some cases being confined to the mediastinum, and in others involving the neck and face only, and still others extending downward over the trunk. The emphysema was not associated with suppuration, nor did it occur with any one type of bacterial secondary infection. In general from its geographical distribution it appeared to be one of the more remote results of primary influenzal infection.

MENINGITIS

Meningeal symptoms appeared in a number of pneumonia patients in most of the camps, and were the occasion of grave anxiety, not only for the welfare of the soldiers concerned, but by reason of the serious results to be anticipated in the event of the spread of epidemic meningitis in a group of men already weakened by influenza and pneumonia, and under hospital conditions of severely overtaxed personnel. Study of these cases showed that they were composed of several types, which included (1) simple meningismus, without evidence of bacterial invasion of the meninges, (2) meningitis due to pneumococcus or streptococcus, and (3) sporadic cases of epidemic meningitis. The number of the latter in several camps was apparently related to the number of meningococcus carriers in the respective camps where this could be determined, and the development of meningococcus infection appeared to have resulted from the depression of resistance in persons harboring meningococci, rather than to an actual epidemic spread of meningitis. This view seems to be supported by the occurrence of occasional cases of meningococcus pneumonia without meningitis following influenza

in the camps of this country, and by the reports of larger groups of meningococcus pneumonia in the A. E. F.

At Custer 8 pneumonias developed meningeal symptoms, in one of which the meningococcus was found in the spinal fluid, in four the pneumococcus, in one streptococcus, and in 2 the fluid was sterile, and symptoms were believed to be due to meningismus. At Beauregard there occurred 5 cases of pneumococcus meningitis and 11 cases of epidemic meningitis, 3 of which developed after patients were convalescing from pneumonia, and had been in the hospital 3 to 4 weeks. Six cases of meningismus were observed. At Travis there were 16 cases of meningitis all due to pneumococcus. At Upton one case of pneumococcus meningitis and a few cases of meningismus were found in 1526 pneumonias. Reports from other camps in so far as available show a similar small number of meningeal complications, a fact of some interest in connection with the relative infrequency of demonstrable bacteremia. Meningitis due to the Pfeiffer bacillus was not mentioned in most of the records and must have been extremely rare.

ABDOMINAL COMPLICATIONS

Abdominal pain and tenderness were noted in numerous cases of influenza and pneumonia and are specially referred to in several reports. In most of the cases the pain, particularly upper abdominal pain, was believed to be reflex from lesions in the chest, such as diaphragmatic pleurisy. In a few instances there was found an upper abdominal lesion usually peritonitis which had extended through the diaphragm from an empyema. Pain in the right lower quadrant suggestive of appendicitis was frequent in influenza, usually unaccompanied by marked rigidity and subsiding rapidly, and often followed by broncho-pneumonia. Along with cases of this type, surgeons met with a small number of fulminant cases of appendicitis which were neither preceded nor followed by pneumonia. At Logan following the influenza-pneumonia epidemic there was a notable increase in the cases of appendicitis.

Peritonitis was encountered six times in 140 necrosies on pneumonias following influenza, in four of which the peritonitis was generalized. In none of these cases was the gall bladder or appendix involved except on the serous surface. In two of the cases a hemolytic streptococcus was recovered from the blood, and in all but one (embalmed) from the heart at necropsy. (Custer.)

Jaundice at necropsy occurred with about the same frequency as is usually noted in lobar pneumonia. It was observed clinically either mild or severe in 112 of 1,474 pneumonias at Beauregard. Severe icterus was found in 9 of 140 necropsies (Custer) usually associated

with demonstrable bacteremia, and in only one instance with marked swelling of the ampulla of Vater.

RUPTURE OF RECTUS MUSCLES

A number of pathological reports record rupture of the rectus muscles, an observation which has been made repeatedly in the past years in cases of lobar pneumonia. The break in the muscle was usually bilateral, partial only, and occurred midway between symphysis pubis and umbilicus. In sections the muscle fibers at point of rupture stained poorly, and there was an accumulation of polynuclear leukocytes. In some instances there was extensive hemorrhage in the rectus sheath. Rupture of the rectus was found 8-times in 140 autopsies. (Custer.) The cough had been unusually severe in some of these cases.

THROMBOPHLEBITIS AND EMBOLISM

Thrombophlebitis usually of the femoral vein occurred occasionally usually late in the pneumonia, and in 3 of 4 cases (2,300 pneumonias) resulted in fatal pulmonary embolism. (Custer.) Femoral thrombophlebitis was seen a number of times at Dodge.

COMPLICATIONS OF EYE AND EAR

The incidence of otitis media seems to have varied somewhat in the camps. The number of myringotomies recorded is not altogether a safe index of the number of cases of otitis media, for spontaneous rupture occurs very frequently often before symptoms are complained of by the toxic patient. Otitis media suppurative was noted 45 times at Custer with four cases of mastoiditis. At Beauregard (1,474 pneumonias) there were noted 41 cases of otitis media and no mastoiditis. Camp Dodge reported 14 cases of mastoiditis and 105 otitis media (catarrhal or suppurative not specified).

Paresis of accommodation (not due to medication) was observed occasionally following influenza and pneumonia, and was probably more common than is shown by available data, by reason of the fact that at the time when observations should have been made to determine this, the attention of officers was devoted to matters more vital to the patients.

KIDNEYS

Albuminuria was found in about 40 per cent of pneumonias on routine examination, about double the incidence of albuminuria in influenza. Casts were found in 22 per cent of pneumonia urines examined. Marked cloudy swelling of kidneys was noted in 21, acute

nephritis in 3, chronic nephritis in 1, abscesses of kidneys in 2 of 123 necropsies. (Custer.)

SKIN

Erysipelas occurred in many of the camps, particularly toward the latter part of the epidemic; a number of these cases followed operation for mastoiditis and empyema. There were 14 cases of erysipelas admitted to contagious wards at Dodge (2,000 pneumonias) of whom 12 recovered. At Custer there were 15 cases of erysipelas two of which followed mastoid operations and empyema.

Multiple furuncles were seen in patients with staphylococcus pneumonia at Jackson.

TREATMENT

In the endeavor to do all possible to save lives many methods of treatment were tried both for prophylaxis and the cure of pneumonia. In general it seems evident that there has been no distinct advance in special methods of therapy, and that so far the most effective treatment is that afforded by rest in bed, good nursing care, a light, easily digested diet, careful observations to detect complications, the treatment of special symptoms such as cardiac weakness by digitalis, as they arise, the avoidance of unnecessary moving of the patient, and continued care with daily watchful supervision and graduated exercise during convalescence.

There seems to have been no value in prophylactic injections of vaccines in the prevention of influenza, nor should we expect there to be, in view of the fact that we do not know the casual organism. Assuming that prophylactic injections of pneumococcus vaccine are effectual in preventing pneumococcus lobar pneumonia, no specific effect from such a vaccine could be anticipated, in preventing pneumonia following influenza due to the streptococcus or staphylococcus.

The most important single factor in preventing pneumonia following influenza was early hospitalization, with rest in bed in warm, well ventilated wards and with precautions to prevent infection of one patient with organisms from other patients who might harbor more virulent strains. The value of immediate rest in bed at the onset of influenza was shown in a multitude of instances. Of two large groups of nurses, one group of whom tried to remain on duty while suffering from influenza, while the other group went to bed at the first symptoms of illness, the incidence of pneumonia was almost twice as great in the first as in the second. Many of the severe pneumonias admitted to the wards from line organizations were in soldiers who had sat around

in quarters during their first attacks of influenza and came to the hospital only on the appearance of the more severe illness.

Care of the bowels providing for daily evacuation, was important. The establishment of any routine treatment to be given all pneumonias, seemed to be productive of as much harm as good. Under such a rule whether digitalis, salicylates, opiates, atropine or other drug is so ordered a number of patients will receive an excess and suffer the consequences of overdrugging. Individualization and common sense were never at a greater premium than in the army camps during the epidemic.

Various forms of intravenous therapy by injecting proteins, vaccines, peptone solutions, solutions of liquor formaldehydi and of glucose were employed, but a review of reports of results obtained does not convince one of their efficacy. It may be noted that their use is not free from danger.

Convalescent serum was used to some extent, with results believed to be favorable by some of those using it. Most of the reports however lack adequate controls, or when controls are given it is not clear that controls and treated cases were distributed equally in the same period of the epidemic.

CONVALESCENCE

The care of the soldier convalescent from pneumonia received considerable attention, in a number of camps. The degree of prostration in these patients was much greater than could be expected from their appearance. Walking but a few steps resulted in tachycardia and dyspnea, and great care was necessary to prevent overtaking of strength. In one camp convalescents were transferred to separate hospital wards, organized into companies of two platoons each, one for the weaker and one for the stronger patients, the patients being graded by their general appearance and their pulse rate. A short walk was given twice a day, first of five minutes, gradually increasing day by day, with later setting up exercises. Games such as ring toss, horse shoes, and indoor amusements and books were provided, to keep the patients occupied when not at meals or resting. The hospital ration, already ample for ordinary patients, was doubled for these men, and still they complained of being hungry. Stews and bacon, affording an excess of fats, together with baked beans in addition to the hospital ration were added, and proved sufficient to satisfy their hunger.

Before discharge by the ward surgeon each man, had to pass two discharge boards, one for heart, and one for lungs, who returned to the ward for one week all patients in whom any disability was detected. By this method of repeated re-examination, over 1000 convalescent

pneumonias were finally discharged from the hospital without the return of one for a complication overlooked at discharge.

While it is probable that we shall not witness in the immediate future a recurrence of the influenza epidemic equal in severity to that of 1918, many of the lessons of the epidemic will apply to the handling of more local epidemics of respiratory disease which are sure to occur where large numbers of persons are gathered together. Early hospitalization at the very onset of illness, with rest and warmth in bed was one of the most important factors in preventing the onset of fatal pneumonia following influenza. Of scarcely less importance was the avoidance of premature discharge from the hospital. The pneumonia of the influenza epidemic, taxed the resistant powers of the patients much more severely than the ordinary illnesses for which soldiers enter army hospitals, and the period necessary for convalescence was correspondingly prolonged. Where this prolonged period of convalescence was intelligently employed in graduated exercises, and the time of the soldier filled with suitable occupations and amusements, there were evident none of the bad effects of prolonged residence in hospital, and when the patients returned to duty after repeated careful medical scrutiny, the return cases arising from recurrences of pulmonary infection or overlooked complications were reduced to a minimum.



A REPORT OF SIXTY OPERATIONS PERFORMED UNDER LOCAL AND REGIONAL ANAESTHESIA

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THIS report is based on sixty more or less major operations selected from those operated under local and regional anesthesia in our clinic from June 1, 1919, to and including December 31, 1920. With the exception of one case that received a little chloroform at the time of severing the posterior root of the Gasserian ganglion, all were operated upon under local or regional anesthesia without exception.

Before attempting an operation under local or regional anesthesia, it is absolutely essential that the operator know his patient. He should attempt to approach the individual in a personal way in an endeavor to gain his or her confidence. The night before the operation he should see and talk to the patient himself, mentioning the painlessness of the operation, that he or she will feel the prick of the first needle only, that the "twilight sleep" will relieve all nervousness and make him sleepy, etc.

One half hour before the operation the patient is given a hypodermic injection of hyoscine gr. 1/100 and morphine gr. $\frac{3}{8}$, if an adult male, and hyoscine gr. 1/200 and morphine gr. $\frac{1}{4}$, if a female. In all cranio-cerebral operations morphine alone is given before the operation. The patient is never allowed to walk to the operating room; but taken on a stretcher, with eyes covered, when the patient is very nervous, and lifted onto the operating table. A solution of 60 cc. is now prepared by adding to sterile water novocain grs. 5 and adrenalin chloride gr. 1/32. The patient is always told when the injection is about to be made. A fold of skin is grasped tightly between the thumb and forefinger and the injection continued, always taking care not to push the needle beyond each succeeding weal. After a block of skin is injected, the needle is run down deeply at 3 cm. intervals, infiltrating the deeper tissues.

Before describing the technique followed in our clinic in securing regional anesthesia I will briefly outline the technique followed in appendectomies, as here the block anesthesia is completed by injecting the ileoinguinal, ileohypogastric, genito-crural, and lower intercostal nerves, or more correctly speaking, infiltrating the tissues in the vicinity of these nerves. The needle is run down to the deeper tissues just above the anterior superior spine of the ileum, making three injections without complete withdrawal of the needle. The first injection is made perpendicular to the belly wall, the second at an obtuse angle toward the median line, and the third upward at an obtuse angle.

In operations on the upper abdomen the 5th, 6th, 7th, 8th, 9th, 10th, 11th, and 12th intercostal and the 1st lumbar nerves are injected on both sides at their emergence from the spine through lines of skin weals previously injected. A transverse incision is always made in operations on the upper abdomen because of the facility with which closure of the wound can be affected. No attempt is made to transfix the recti in their sheaths, as the cut muscle ends always extrude when the time for closure is at hand. In operations on the lower abdomen, a transverse incision is also employed, except in appendectomies. All of the lumbar and the upper four sacral nerves are injected, especially in operations involving the pelvis.

THE CERVICAL PLEXUS

For injection of the cervical plexus a point on the neck 6 cm. below the tip of the mastoid and just behind the posterior border of the sternocleidomastoid muscle, the head being turned to the opposite side, is selected. The needle is pushed upward and slightly backward toward the spine at an obtuse angle. Three injections are made: the first as already described, the second after withdrawing the needle part way and injecting $\frac{1}{2}$ cm. higher, and the third 1 cm. lower than the second. This is employed on one side only after injecting a block of skin.

THE BRACHIAL PLEXUS

After several unsuccessful attempts at injecting this plexus, having failed to secure all branches, we made a flap skin incision, isolating the larger vessels and injecting all the branches of the plexus above the clavicle. In operations on the shoulder, it is necessary to inject the cervical plexus, the lower cervical and the upper thoracic nerves as well.

TABULATED CASES

Name	Case number	Age	Operation
A. O. W.....	A|6593	33	Trepanation of skull with removal of bone en bloc, removed intracranial 32 calibre bullet, 2 bullets removed from right thigh and groin. Recovered.
Mrs. W. B.....	A|6606	23	Osteoplastic flap craniotomy for epilepsy, dural-arachnoid adhesions with distension of subarachnoid spaces. Laceration of arachnoid, puncture lateral ventricle. Recovered.
Miss M. C.....	A|3706	19	Mastoid operation. Recovered.
Mrs. H. N.....	A|4464	50	Pylorotomy, posterior all suture no loop gastroenterostomy. Recovered.
Miss A. N.....	A|2265	31	Craniotomy, puncture lateral ventricle. Subtemporal Decompression. Recovered.
G. P.....	A|6820	11	Trepanation of skull with removal of bone en bloc, a piece of pericranium placed over laceration in longitudinal sinus to stop hemorrhage. Recovered.
I. N.....	A|6837	8	Subtemporal decompression, ligation of middle meningeal artery. Recovered.
L. M.....	A|6851	19	Debridement of frontal bone left side, subtemporal decompression same side, fracture middle fossa extending into foramen spinosum, middle meningeal artery torn away at foramen. Recovered.

TABULATED CASES—*Continued*

Name	Case number	Age	Operation
F. L.	A 6866	26	Herniotomy, operation for bunions both feet. Recovered.
Mrs. J. J. M.	A 6916	39	Radical operation for carcinoma right breast. Recovered.
L. M.	A 6351	19	Reoperation for skull defect, costo-chondral cartilage graft. Recovered.
R. N.	A 7139	15	Appendectomy (acute perforative appendicitis complicated by lobar pneumonia). Recovered.
J. O. R.	A 7176	39	Posterior all suture no loop gastroenterostomy for perforating ulcer and severe hemorrhage. Died 4th day postoperative.
E. M.	A 6644	17	Exploratory craniotomy. Hemisphere covered by numerous greatly distended veins. Puncture lateral ventricle. Recovered.
H. A. M.	A 7173	50	Exploratory laparotomy (carcinoma liver). Died 2 weeks post-operative.
C. H.	A 7226	25	Herniotomy, unilateral castration. Recovered.
Mrs. W. L.	A 7180	38	Osteotomy. Recovered.
J. M.	A 7245	25	Debridement, suture of severed extensors of foot. Recovered.
Mrs. M. J. S.	A 2707	63	Operation for cystocele, perineorrhaphy. Recovered.
E. S.	A 7275	23	Osteotomy. Recovered.
Mrs. R. B.	A 7718	28	Ligation superior thyroid arteries. Recovered.
J. P. K.	A 7196	48	Opened and drained retro-hepatic abscess. Recovered.
Mrs. G. B.	A 2243	59	Severed posterior root Gasserian ganglion. Died 10th day post-operative. Pulmonary edema.
F. W. A.	A 7373	34	Removed tumor left breast. Recovered.
Mrs. J. B. J.	A 5017	50	Removed impacted stone from cystic duct. Recovered.
Mrs. J. E. C.	A 7163	78	Cholecystectomy, removed large fibroid weighing 6 lbs. Died 2 weeks postoperative. Uremic coma.
M. D. H.	A 7436	46	Herniotomy, operation for varicocele. Recovered.
J. G.	A 4383	73	Herniotomy. Recovered.
W. D.	A 2340	23	Herniotomy, unilateral castration, appendectomy. Recovered.
Mrs. J. R.	A 4599	70	Cholecystotomy and drainage, section removed from liver for examination. Recovered.
Miss M. H.	A 6293	24	Thyroidectomy, appendectomy. Recovered.
Miss C. O.	A 3645	48	Thyroidectomy. Recovered.
Mrs. T. A.	A 7455	63	Postoperative adhesions of bowels to abdominal wall. Recovered.
Mrs. J. A.	A 1106	65	Cholecystectomy, impacted stone removed from common duct. Died 5th day post-operative. Uremia.
E. O.	A 3677	26	Removal of large osteoma from tubercle of radius. Recovered.
Miss I. L.	A 4024	32	Posterior all suture no loop gastroenterostomy for acute perforative ulcer. Died 9th day postoperative.
Miss M. G.	A 7557	56	Exploratory laparotomy. Recovered.
Miss L. U.	A 6101	17	Removal of large benign tumor of left breast. Recovered.
C. W.	A 1464	69	Severed posterior root Gasserian ganglion. Recovered.
Mrs. F. J.	A 7482	34	Removal of cervical glands. Recovered.
J. B.	A 7638	24	Herniotomy. Recovered.
Mrs. S. O.	A 7808	76	Vaginal hysterectomy, perineorrhaphy. Recovered.
Miss F. O.	A 5339	19	Appendectomy. Recovered.
Miss L. L.	A 7950	22	Subtemporal Decompression. Recovered.
W. H.	A 6803	43	Resection distal end left ulnar. Recovered.
Mrs. L. O. E.	A 5783	23	Appendectomy. Recovered.
E. H.	A 7961	70	Suprapubic cystotomy. Recovered.
O. M.	A 7391	20	Appendectomy. Recovered.
A. K.	A 7980	55	Appendectomy (acute perforating). Recovered.
Mrs. A. C.	A 2247	55	Cholecystotomy and drainage. Recovered.
Miss J. L.	A 7957	30	Thyroidectomy. Recovered.
R. A. B.	A 7573	40	Herniotomy. Recovered.
G. R. C.	A 2450	50	Debridement of skull suboccipital region, a portion of pulped cerebellum removed by patient's coughing and gentle irrigation with deci-normal saline solution. Died 4th day postoperative.
Mrs. H. M.	A 3317	68	Trepanation of skull with removal of bone en bloc. Recovered.
O. K.	A 8212	18	Appendectomy. Recovered.
J. C.	A 8338	52	Suprapubic cystotomy. Recovered.
P. B.	A 8090	40	Herniotomy. Recovered.
C. B.	A 8398	52	Herniotomy. Recovered.
W. H.	A 8462	50	Trepanation of skull for depressed fracture of right occipital region with pulping of right occipital lobe. Pulped brain removed by gentle irrigation. Blood clots and blood from active hemorrhage removed, hemorrhage controlled. Died 3d day postoperative. General cerebral edema.
B. B.	A 8320	48	Removal of right upper extremity including clavicle and scapula. Died 10th day postoperative. Coronary embolism.

NOTE.—Only one case, the Gasserian ganglion that recovered, received a little chloroform at the time of severing the posterior root. Nitrous Oxide and Oxygen anesthesia was contraindicated because of a high blood pressure.

SUMMARY.

Craniotomies.....	9	Cholecystotomies	2
Subtemporal Decompressions.....	4	Impacted stone common bile duct.....	1
Gasserian Ganglion posterior root.....	2	Impacted stone cystic duct.....	1
Graft for skull defect.....	1	Appendectomies.....	7
Mastoid.....	1	Herniotomies.....	9
Thyroidectomies.....	3	Vaginal Hysterectomy.....	1
Ligation superior thyroid arteries.....	1	Perineorrhaphies.....	2
Pylorrectomy.....	1	Cystotomies.....	2
Gastroenterostomies.....	3	Miscellaneous.....	..
Cholecystectomies.....	2		

Of the sixty cases here tabulated, nine died: 2 from uremia; 2 were almost exsanguinated before operation; 2 were severe cranio-cerebral injuries; and 1 died from coronary embolism on the 10th day. With the exception of four cases, a general anesthetic was contraindicated because of diseases of the kidneys, heart, blood vessels, and anemia.

The mortality in these cases is undoubtedly lower than if a general anesthetic had been given. In a large number of the cases, operation would have been impossible any other way.



THE USE OF DAKIN'S SOLUTION, DICHLORAMINE-T, AND EUSOL, IN THE TREATMENT OF SUPPURATING WOUNDS

LECTURE BY LIEUTENANT WYANT

At Lieutenant Colonel Keller's Hospital, January 11, 1918.

IN THE TREATMENT of wounds, I wish to mention the use of the chlorine containing-solutions as Eusol, Dakin's solution and "Dichloramine-T."

The preparation of the dichloramine-T oil embraces three steps:

First, the solvent eucalyptol (U.S.P.) is chlorinated. Five-hundred c.c. are treated with 15 gms. of potassium chlorate and 50 c.c. of concentrated hydrochloric acid for 12 hours or longer; then well washed with water and sodium carbonate solution. The water is drawn off and 15 gm. of dry sodium carbonate are added to the oil and the whole is allowed to stand for 24 hours. The oil is filtered off, dried with a little solid calcium chloride when it is ready for use.

Second, the paraffin oil is chlorinated. To 500 c.c. of concentrated paraffin oil, 15 gm. potassium chlorate and 50 c.c. of concentrated HCl. are added and the mixture exposed to light, preferably sunlight, for several hours. It is then transferred to a separating funnel and washed successively with water; a solution of sodium carbonate, and again with water. The opalescent oil is drawn off, sodium calcium chloride added in small quantities, and about 5 gm. of animal charcoal. On subsequently filtering through paper, a yellowish oil ready for use is obtained.

The *third* step is the preparation of the oil solution of dichloramine-T for use in the spray. 0.2 gm. of the dichloramine-T is dissolved in 2 c.c. of the chlorinated eucalyptol without heating. When the solution is complete, 8 c.c. of the chlorinated paraffin oil are added. After mixing, the solution is ready for use. The solution contains 2 per cent dichloramine-T and is relatively unstable and should be discarded as soon as a distinct precipitate makes its appearance. An opalescence or moderate cloudiness is not evidence of material deterioration. It is a safe rule not to use the *completed* solution for more than 3 or 4 days after its preparation. It should be protected from strong light and is best kept in a cool place. Where large quantities are needed, a stock of 10 per cent solution of dichloramine-T in eucalyptol may be prepared and kept on hand in a cool dark place for dilution with the paraffin oil 1 :4, as required. The eucalyptol solution will suffer little deterioration in a month.

It is best applied by an oil spray, an ordinary hard rubber or all-glass atomizer being the most practical method. Metal atomizers are not suitable since the metal is attacked by the chlorine. This oily solution

presents the first great advantage—the dressings do not stick to the wound and the entire act of dressing is relatively painless. The gauze does not have to be separated from the granulations by soaking; the old dressing is simply lifted off and the wound sprayed; the force of the spray will dislodge the sloughs, and the wound is covered with a fresh dressing. It is evident that a very important saving of time results from this simplicity of dressing.

The solution contains enough available antiseptic so that one dressing every twenty-four hours is ample for large deep wounds, and one dressing every forty-eight or seventy-two hours is enough for the simple or more superficial wounds. The oily solution creeps into all the wound crevices and corners, and it can be readily introduced into sinuses by means of a cotton swab dipped in the solution. The preparation is not irritating to the skin of mucous membrane, except possibly to the rare individual who possesses an idiosyncrasy to the eucalyptus oil. The points in favor of dichloramine-T in solution in eucalyptol and paraffin oil in wound treatment are: The elimination of the Carrel tubes; the time taken for the periodic flushings as necessary in Carrel-Dakin application; the rapidity with which a surgeon can dress his cases; the appreciable saving of dressing material; the lessened amount of pain of wound dressing.

In the use of Eusol the same technique is employed as with the Carrel-Dakin treatment. In the preparation of the solution we take 135 c.c. of the B. P. liquor calcic chlorinatae; dilute with water 1 liter, add 10 grams of boric acid and shake until dissolved. The solution remains clear and without further treatment is ready for use. If preferable, a saturated solution of boric acid may be stocked at room temperature. This contains 4% of boric acid; therefore 250 c.c. give the amount required for 1 litre of sol. of eusol. In making eusol this way, the 135 c.c. of liquor calcic chlorinates should be diluted to 750 c.c. and 250 c.c. of boric acid solution added. This prevents the formation of the precipitate which occurs if boric acid be added to undiluted liquor calcic chlorinatae.

By this method, eusol can be prepared at a moment's notice by diluting and mixing two stock solutions, both of which are stable.

The Carrel-Dakin treatment is the introduction into the wound of a hypochlorite solution in sufficient amounts and strength to retard the growth of bacterial flora and produce progressive sterilization in the wound if possible.

The solution used is Dakin's, consisting of:

Chloride of lime.....	200
Dried Carb. of Soda.....	100
Bi-carb. of Soda.....	80

and water enough to make 10 liters of solution. The 200 grams of chloride of lime are placed in a bottle with 5 liters of water and shaken well at several intervals, then allowed to stand over night. The carbonate and bi-carbonate of soda are dissolved in five liters of water in another container and then the solution of the soda salts is turned into the bottle containing the solution of the chloride of lime. This is shaken vigorously and then allowed to stand for a few minutes in order to allow the carbonate of lime to settle to the bottom. The clear fluid is then siphoned off and filtered through filter paper to obtain a perfectly clear solution, which is now ready for surgical use and contains about one-half of one per cent of sodium hypochlorite with small quantities of neutral salts of soda. No heat is used in the preparation or in the use of the solution. It must be freshly made and kept from the light in well corked bottles.

It is a neutral solution and markedly isotonic to blood serum. Marvelous results are obtained with this solution upon infected wounds, especially if used before the suppuration is well established and even then, it shortens the suppurative period, rendering the wound almost germ-free in a comparatively short period.

In changing the dressing, careful attention to details and antiseptic precaution is necessary, and for this reason we observe our technique as carefully as in an abdominal operation. Two pairs of dressing forceps are used to handle the tubes and dressings. Rubber tubes of size No. 7 tubing, and about ten inches long, are used to carry the solution into the wound. The distal end of the tube is closed with a ligature with numerous lateral small openings perforating the tube for about one-half the length. The part of the tube with the perforations in it is buried in the wound and held in place with a small piece of gauze dampened with the solution. The proximal ends of the tubes coming from the wound are held by the assistant who connects them up to a glass distributor which in turn is attached to a larger tube, which brings the solution from a bottle hung at a convenient height to allow instillation into the wound. The number of tubes employed as well as their size is determined by the size and extent of the wound, as well as the amount of infection. The number and intervals of the irrigations being regulated by a stop cock on the main tube. It is necessary for the solution to come in contact with every corner of the wound, so just enough fresh solution is allowed to gravitate to the wound every two hours to flush the tissues and keep the dressings moist. Several layers of gauze moistened with the solution are placed on the outside of the wound as a dressing, and a large pad placed over the whole to absorb any superfluous solution which may have come from the wound.

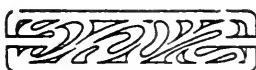
In large superficial areas, as many tubes as deemed necessary are

placed on the surface of the wound, being held in place by gauze saturated with the solution. The proximal end of the tube is fastened to the skin with adhesive at a safe distance from the wound.

In case of wounds involving the pleural cavity, a drainage tube is inserted with the Carrel's tubes to permit a return flow of the fluid and discharge. In case of excessive coughing due to the irritation caused by the fluid, the irrigations are temporarily discontinued.

We continue the use of the solution until the discharge is of a mucoid nature and a smear shows one organism in from 3 to 5 fields. After we discontinue the irrigations, we dress the wound every day with a dressing saturated with the solution.

The solution may have an irritating effect on the skin of some patients but this can be avoided by applying sterile vaseline around the wound when changing the dressing.



EXPERIENCES OF A MEDICAL OFFICER IN 1849

BY LIEUT. COL. LOUIS C. DUNCAN

Medical Corps, United States Army

THE following official report throws some light on the work of a medical officer of the Army in the "days of Forty-nine." At the first of the year a small body of troops was assembled at Fort Leavenworth, in preparation for an expedition to Sante Fé, New Mexico. Assistant Surgeon Thomas A. McParlin accompanied a part of the 3d Infantry and 2d Artillery on a river voyage from Jefferson Barracks to Fort Leavenworth. While the men were crowded on the boat, cholera, then slowly spreading over the country, appeared. The measures for sanitation and treatment made use of are interesting and curious. Means of infection were then, of course, unknown, yet McParlin inspected his men twice daily, with the object of detecting and treating cases early—a measure typical of present-day methods. The use of mercury for vomiting, on account of its weight, appears somewhat like a humorous item of today.

Assistant Surgeon McParlin succeeded Jonathan Letterman as Medical Director of the Army of the Potomac in January, 1864, and carried Letterman's evacuation system to a high degree of efficiency. Assistant Surgeon William A. Hammond became Surgeon General of the Army in 1862, in which office he revived a moribund medical department and either instituted or recommended many of the improvements which the Medical Department of today enjoys.

McParlin's letter was addressed to Dr. Thomas Lawson, then Surgeon General of the Army with rank of brigadier by brevet only. Fort Leavenworth was not in Missouri but in what was then Indian Territory. The original report was written by McParlin himself in a good, clear hand and in correct English. It would compare very favorably with a good many reports made in 1918-1919.

Report of a Trip from Jefferson Barracks to Fort Leavenworth in 1849, by Asst. Surgeon Thomas A. McParlin.

Camp Kearney, Sante Fé Command, near Fort Leavenworth, Mo., May 3, 1849.

Sir: I have the honor to report my departure from Jefferson Barracks on April 23d and my arrival at Fort Leavenworth the 30th ultimo with the troops destined for New Mexico; Companies D, F, G, H 3d Inf. and B & D 2d Artillery [serving as Infantry, L.C.D.] Capt. & Bvt. Lt. Col. Alexander 3d Inf., commanding. Asst. Surgeons C. H. Smith & Wm. Hammond [afterwards Surgeon General, L.C.D.] also accompanied the troops. I was ordered to attend the sick and to receive such assistance from the other medical officers as might be required.

The morning of the 23d April set in with rain, making the grounds and

roads about the Barracks very miry and disagreeable. It continued to rain during the day. At 1 p.m. the Steamer St. Paul arrived and the troops were occupied in embarking until 8.30 p.m., when the steamer got under way.

The troops continued in good health until the 25th, when epidemic cholera appeared; for the first time in the case of Private Troepring (F. 3d Inf.). He was promptly treated, recovered, and returned for duty (May 1st). On the 26th three cases were reported; on the 27th four; on the 28th and 29th eight and seventeen respectively were reported, as the Register shows; subject perhaps to slight inaccuracies. The disease continued thus its ravages until the 30th when we arrived at Ft. Leavenworth. Every measure was put in requisition to abate its violence; by strict police regulations; and the men were (morning and evening, at such times as would least expose them to sun or dew) mustered upon the upper deck, by companies, inspected and questioned; in order to check the disease in the preliminary or formative stage of Choleraic Diarrhoea. In some cases this was effected and recoveries ensued. Dried apples (we learned subsequently) were issued to the two companies of Artillery (B and D) on the 28th at 12 m. They were, I have reason to believe, badly cooked; particularly those prepared for Co. B; inasmuch as early in the morning of the 29th (1 a.m.) one man (of B Co.) was seized, and during the day the seizure in the two companies (and the disease seemed to select them) was as follows: B Co., 8; D Co., 4.

A gentleman from Georgia (occupying an eligible stateroom in the Ladies' Cabin) was seized during the matin hours of the 29th and died at 4 p.m., under the care of a civil practitioner. Lieut. Nones, 2d Art., complained at the same time of choleraic symptoms (colliquative and characteristic dejections, nausea, vomiting, etc.). He is now recovered and in camp.

A detail of events will perhaps go far to account for the malignancy of the cases of the 29th ult. The Steamer (*I learn*) had been visited by cholera several times during the season, no less than 80 cases have occurred prior to those herein reported. Drawing too much water, she was unsuited to the navigation of the Missouri River, (it having been called an experimental trip) whose ever-varying channel and uniformly shallow depth render navigation uncertain and difficult. These points could have indicated steamers of lightdraught, and in such numbers as would have prevented crowding of the men—particularly at a season when cholera was rife in that section, and upon such rivers as the Missouri and Mississippi, collecting from their sources the great landwash, and floating vegetable matter, exposed to the action of a burning sun.

The majority of the men were necessarily quartered on the lower deck between the machinery. Numbers were forced to remain upon the forward part of the main deck—protected by awnings and canvas, close-hauled at night, or during the prevalence of wind. The officers occupied a few of the staterooms; the remainder were occupied by citizens; to so many of whom the Captain had given passage that the entire area of the cabin proper was strewn (after 9 p.m.) with mattresses, etc., and even when thus crowded several remained unaccommodated the entire night.

The evils of an air so soon and extensively vitiated could have been adequate to the results noticed, and they are less remarkable when we consider how greatly the atmospheric impurity would be enhanced by the vessel being compelled, from great draught of water, to lie to all night where the air is tranquil, thus cutting off the current of air produced by the progress of the boat; and, after rounding to, or getting aground to leeward of a bluff or thick growth of cottonwood, thus interrupting any breeze from the land. Superadded to these, the depressing influence of panic, the necessary intermixture of the well and diseased, the increased detail of attendants necessary to a proper care of the sick, whose strong spasms in every part (in several cases) rendered counter irritation and the friction of many hands necessary to quiet outcry, and I faintly image a single case.

On the 29th, in that part of the Boat devoted to the care of the sick, near to 20 cases were being treated at once. Prior to this [date] the Steamer grounded on a bar where nothing could get her off, until all the men (sick and attendants excepted) and much public (Q.M.) property were removed to the land. She remained aground during the evening and night. The officers and men were compelled to build camp fires and bivouac for the night. Preparations from the steamer were made for their supper, and materials for breakfast sent to them in an open boat. On the 27th, I believe, the steamer cleared the bar by means of levers; the command on shore was signalled to march to Lexington (8 miles) where the Steamer reembarked them. Early on the morning of the 28th a bar was again encountered, to clear which the men were again landed and marched a mile (about 5 a.m.) and embarked again.

After this the malignant cases set in and accumulated upon us. It was thought before the first bivouac that a march of a few miles would aerate [sic] and invigorate the troops; but no one anticipated the necessity of bivouacking at night.

The frequency and duration of these delays lengthened the passage to 8 days; during which time the men were unavoidably between decks, exposed to a humid atmosphere from the machinery and escape of steam.

Along the shores of the Missouri the cholera seems equally to have made its ravages. At "Kansas" [Kansas City?] 28 miles by land from Ft. Leavenworth, with a population of 600, 14 cases of cholera occurred. We passed the town and it was rumored that the inhabitants had fled the village—this has been confirmed subsequently. At the same time, in a camp of Californians near, no case had occurred. At Independence, Mo., 4 cases were reported.

The *Symptoms* present were: anxiety and humidity of countenance; blueness and shrivelling of the cuticle from excessive absorption of fluids; disturbed respiration; pulse frequent and thready, in many cases imperceptible; eyes sunken and dimmed, vision imperfect; nausea, vomiting, and dejections of whitish fluid interspersed with white flakes or flocculi; cramps, dampness, extreme colliquative perspiration, collapse, urgent thirst, suppression of urine, etc., jactitation, voice feeble and interrupted; breath foetid; teeth covered with sordes; tremor, subsultus, coma, death.

Treatment.—When the disease was reported early astringents, opiates, antispasmodics, general stimulants exhibited at short intervals: for example, Pulv. Kino; Plumb. acetat; Opii. Tinct. Camph; and the preparations of morphia, asafoetidae, capsicum, Sinapis (internally and externally), etc. When vomiting was excessive and frequent medicines were thrown out at the instant nearly of exhibition—in such cases hydrargyrum submuriatis dram one in pill form would be retained, from its great specific gravity. . . . A draft of the Sulph. of Morph. would tend to allay gastric irritability; forming a simple preliminary to medication. . . .

[Here follows more along the line of treatment.]

Asst. Surgeon C. H. Smith & Wm. Hammond rendered opportune and valuable assistance, which I have to acknowledge. The frequent interruptions and inconveniences of camp life render an elaborate report impossible and will, I hope, excuse the imperfections of this sketch hastily penned within a few days of our march [to Sante Fé, -L.C.D.] Should Brevet Maj. General not assume command before, we shall probably leave for that place the 12th. [The march to Sante Fé was begun May 13-L.C.D.] Asst. Surgeons J. F. Hammond & John Byrne are also with the command.

With Utmost of high consideration and respect

I have the honor to remain your obedient servant,

THOS. A. MCPARLIN, *Asst. Surgeon, U.S.A.*

DOCTOR THOS LAWSON,

Surgeon General, U.S.A., Brigadier General by Brevet.

Report Received May 23, 1849.

SUMMARY OF REPORT	
Seized with Cholera.....	27
Choleraic Diarrhoea.....	6
	<hr/>
	33
Sent to General Hospital.....	14
Recovered.....	12
Died.....	7
	<hr/>
	33
Third Infantry: D Co.....	2
F Co.....	5
G Co.....	5
H Co.....	1
Third Artillery: B Co.....	9
D Co.....	4
Mounted Rifles.....	7
	<hr/>
	33

The epidemic of cholera herein mentioned was the second appearance of the great Asiatic scourge in America. The first cholera epidemic was carried by poor English and Irish emigrants to Quebec in 1832, spread over the States gradually, and continued until 1834. The second epidemic started in the plains of the Ganges about 1844, reached Persia in 1845, then crossed to the Black Sea and ascended the great rivers of Russia. It appeared in St. Petersburg and Berlin in 1847 and soon spread over Europe.

In December, 1848, Atlantic ships brought cholera to both New York and New Orleans. In the former place, after the appearance of a few cases, the disease was stamped out. In New Orleans it quickly spread over the city and caused 3,500 deaths. From there the epidemic ascended the Mississippi River, reaching St. Louis on January 5, 1849. Here the disease snuffed out 4,000 lives. From the central valley cholera spread east to Nashville, Cincinnati, Cleveland and Chicago. Meanwhile the disease again appeared in New York and soon spread throughout the Eastern States. In the West, cholera followed the great emigrant trails, struck down travelers as they toiled across the plains, and burst upon the Land of Gold in 1850. Every great trail was soon marked by a line of graves of gold seekers, Mormons, traders and soldiers who then gave life to those picturesque highways. Rivers and trails were the principal paths of transmission for the epidemic, and it was in this way that Dr. McParlin encountered it. Another and much more fatal outbreak occurred during the construction of Fort Riley in 1855. In this epidemic also a number of medical officers, later prominent in the Army, were concerned.

THE PLAN OF MEDICAL EVACUATION

BY LIEUTENANT-COLONEL M. A. W. SHOCKLEY

Medical Corps, United State Army

IN ORDER to systematize the solution of the medical phases of combat problems of the Army, corps, and divisions, and to a certain extent of the smaller units, it has been found advisable at the General Service schools to adopt a standard, concise form for the estimate of the sanitary situation and a standard form for the medical plan of evacuation; a mechanism for arriving at the decisions for use and location of sanitary units of evacuation. While it is not absolutely necessary to have a standard form or mechanism for these procedures and recommendations, it is believed that a systematic, concise arrangement of the premises taken from the general military situation will lead to more rapid, orderly, correct, and logical conclusions and decisions. It is further believed that a standard form for the plan of evacuation will prevent delay, omissions, and errors in the preparation, understanding, and execution of such a plan.

The same arguments that are applied in support of the standard form of the combatant estimate of the situation and of the field and administrative orders can be applied in support of a standard medical estimate of the situation, mechanism of decisions, and plan of evacuation.

In preparing this system, an attempt has been made to follow the same reasoning that has dictated the standard combatant forms, and to follow a natural arrangement in accordance with the sequence in which military information is acquired either by reconnaissance, orders, or reports.

In order to permit rapid preparation and sometimes preparation in advance, checking and understanding, the paragraphs and subparagraphs should be numbered and lettered as given, and only the matter permitted in these paragraphs should be included.

A. ESTIMATE OF THE SITUATION

1. Mission (combatant) of our own force.
2. The enemy force:

(a) Strength, composition, type of enemy artillery and air forces and probable position as affecting distance, cover and routes of sanitary units; amount of his sanitary troops and supporting evacuation service, as affecting our evacuation.

(b) Position as affecting observation; fire, duration of action, and movement of our combatant troops.

(c) Movement, as affecting position of our combat troops.

(d) Probable intentions, as affecting dispositions of our

combat troops, and consequently the sanitary service, and number of casualties Blue and Red.

3. Our own force (combatant and auxiliary).

(a) Strength and composition—especially artillery, as affecting enemy artillery and our sanitary units including division, corps, or army sanitary units attached.

(b) Our position, as affecting casualties and cover, sites and routes for sanitary units and route of evacuation.

(c) Our supporting troops—especially division, corps, army, or zone of communication sanitary units or establishments.

4. Probable subsequent action of combatant commander.

(a) Continuation of movement; pursuit; flank guard; withdrawal-method; position in readiness; retreat-methods; strength of rear guard; attack-frontage, and method; delaying action-frontage, duration, directing and method of retirement; defense frontage, duration, fire cover.

5. Decisions as to use of sanitary service.

(a) Decision as to number of our casualties to be prepared for. Decision as to number of enemy casualties to be prepared for.

(b) Decisions as to probable duration of action.

(c) Consideration of means of evacuation available, and decision as to means and method (division, corps, Army, impressed locally?).

(d) Decision as to amount and method of procurement of evacuation service.

(e) Decision as to amount of local sanitary establishment used and reserves to be held out.

B. MECHANISM OF DECISIONS FOR PLAN OF EVACUATION

1. Consider—frontage of position of command—plot position of command on map with external, internal, and rear boundaries.

2. Determine route of evacuation as a probable position of hospital companies, reserves, and station for slightly wounded; distance, cover, and forward routes considered. Selection of tentative sites of hospital companies, station for slightly wounded, and medical supply section. (Plot in evacuation points.)

3. Determine position and number of dressing stations required by situation, our combat dispositions, lines of drift of wounded, cover, water, conveniences, enemy observation, and fire, and routes of communication to front and rear considered. Coordinate this with routes in 2 and 4.

4. Consider ambulance routes from ambulance head through dressing stations to hospital companies and select those most satisfactory for day and night traffic.

5. Consider and decide as to position of local support or reserves of ambulance and sanitary companies—Coordinate with 4.

6. Decide as to definite sites of hospital companies, position of dressing stations (3) ambulance routes (4), route of evacuation, function, cover, shelter, wood water, enemy fire, traffic regulations, and future movement considered.

7. Decide as to definite sites for station for slightly wounded, depot slight cases, reserve sanitary units. Same elements considered as in 6.

8. Decide as to definite site and action of medical supply section. Same consideration as in 6.

9. Decide as to method of classification of casualties according to method of evacuation and hospitalization.

10. Decide as to method of movement of walkers.

11. Decide as to method of sanitation of the field, including troops and material for this purpose.

12. Decide as to use of prisoners of war en route to cage as litter bearers.

13. Decide as to necessity for construction of fire cover.

C. PLAN OF EVACUATION

1. The purpose of the plan of evacuation is to give a complete statement of the data relating to this plan which is necessary to the various staff officers, surgeons, commanders of trains, sanitary units and combatant organizations concerned. This information must be presented in a concise, orderly manner so that the portions of the plan affecting the duties of these various officers and units can be found without delay, and can be easily interpreted and executed.

As G-4 and G-3 will extract a part of the plan for incorporation in the administrative and field orders, respectively, such matter should be placed where it can be found easily and should be worded so that it can be inserted in the proper order without paraphrasing.

2. The entire plan of evacuation is, as a routine, submitted to G-4, and as soon as it is checked or changed (to coordinate it with the entire G-4 plan) and approved, it is distributed in order to secure early action, by avoiding the delay incident to preparation of the administrative orders.

3. The plan of evacuation must cover all the essential details of disposition and function of the sanitary service. As it is equivalent to a field order, it should not invade the functions of unit commanders

any more than is necessary for proper action of the sanitary service. Reference to the standard forms attached will show that the following subjects are covered:

Place, date, hour of issue, source, destination, subject.

Paragraph 1 contains the operation for which the plan is intended, without any explanatory discussion.

After this follows the body of the plan, arranged in seven roman numbered paragraphs of three columns for ease in preparation, checking and reference. The first column should include the organization or unit, site, and may include time of establishment. Where the headquarters or main portion of the unit has another site, the detachment site and time of establishment will usually be put in the third column. See Ia division plan.

The second column should include the total number of sections and units and also the number of units distributed. The distribution should be checked against the total to prevent omissions.

The third column should include the action, function, or class of cases handled.

I. *Collection*.—(a) Include all matters relating to station for slightly wounded, depot slight cases, or march collecting stations. (b) Matter relating to ambulance companies, sanitary companies, bearer heads, relay posts, ambulance heads, dressing stations, etc. (c) Local, battalion, and regimental aid points, rest stations, etc.

II. *Hospitalization*.—Include in this and subheads matter relating to special types of hospitals, separating each type into lettered subheads according to types of organization, cases handled, or function, as may be most logical. Include in this head additional medical units which may have been assigned for duty with the sanitary service of the division from the sanitary service of the Army or Army corps, such as surgical hospitals, laboratories, surgical teams, etc.

III. *Supply*.—Include site of supply units and function as “dump and refill”—and where necessary give location of refilling point.

IV. *Routes and destination*.—Include here so much of routes or destinations as may be necessary.

V. *Classification*.—Include any departure from normal classification required or insert “Routine.”

VI. *Evacuation*.—Give such details of evacuation not covered by previous paragraphs as may be necessary.

VII. *Veterinary Service*.—Include site of veterinary company of medical regiments and function as animal evacuation.

General—Include each paragraph in the plan with an appropriate remark to show that consideration of it has not been omitted.

Paragraphs 2, 3, and 4.—Include in these paragraphs recommendations covering details of requests or recommendations for additional aid for evacuation, interment, construction of fire cover and shelter and roads, use of trucks, prisoners of war, etc. Each subject should be covered by a separate lettered or numbered paragraph.

DISTRIBUTION LIST:

C of S.....	1
G1.....	1
G3.....	1
G4.....	1
Medical Evacuation Officers (Army).....	1
Surgical Officers.....	1
Commanding Officers, Medical Regiment.....	3
Surgeon, next higher unit.....	1

PLAN OF EVACUATION DIVISION OR REENFORCED BRIGADE

Hq., (D.S.O.), 1st MED. REG., 1st Div.,

Fairfield, Pa., June 2, 1920, 12.00.

Memorandum for G4, 1st Division,

Subject: Plan of evacuation.

1. Below find plan of collection, hospitalization, supply, and evacuation 1st Division for coming attack:

<i>Organization and location</i>	<i>Number of units</i>	<i>Function</i>
I. COLLECTION:		
(a) 1st Med. Reg.	1	Establish SSW MIEDLEY CROSS-ROADS (1 mile south west of HILL 766 at H minus 4 hour).
(b) Ambulance Cos.	3	
3d Amb. Co.		
Vicinity of WILLOUGHBY RUN west of J. BIESECKER farm at H minus 5 hour.	1	Cover zone of attack. 1st Brig.
2d Amb. Co. (less one section of 5 ambulances) Vicinity of PITZER S H at H minus 5 hour.	1	Cover zone of attack. 2d Brig.
One Amb. Sec. of 5 ambulances, 2d Amb. Co. at H minus 4 hour		Relay from 3d Amb. Co.
Hq. Amb. Bat. and 1st Amb. Co. (ad) Vicinity house 300 yds. SE H E BOYD at H minus 4 hour	1	Reserve.
(c) Sanitary Cos. 3d San. Co. Vicinity WILLOUGHBY RUN west of J. BIESECKER farm at H minus 5 hour.	3	Cover zone of attack 1st Brig.
2d San. Co.	1	Cover zone of attack 2d Brig.
Vicinity of PITZER S H at H minus 5 hour.		

- Hq. San. Bat. and 1st San. Co. 1 Reserve.
 Vicinity house 300 yds S E H E
 BOYD at H minus 4 hour.
- II. HOSPITALIZATION:
- (a) Hq. Med. Reg. Hq. Hosp. Bat.
 4 (in. M.L.S.)
 1st and 2d Hosp. Cos. 2 Establish sorting and gas hospital.
 Vicinity CROSSROADS 583 at H
 minus 4 hour.
- (b) 3d Hosp. Co. Med. Labor Section. 2 Reserve.
 Vicinity unimproved road 990
 NW CROSSROADS 590 at H plus
 2 hour.
- III. SUPPLY:
- Medical Supply Section. 1 Supply Corps Supply Point
 Vicinity CROSSROADS 583 at H CROSSROADS 630.
 minus 4 hour.
- VII. VETERINARY SERVICE:
- Veterinary Co. 1 Animal evacuation.
 Vicinity unimproved road 990
 yds. NW CROSSROADS 590 at H
 minus 2 hour.
- V. ROUTES AND DESTINATIONS:
- Ambulance routes:
 To 1st Brigade: MIEDLEY CROSSROADS—563—MCGREARY S.H.—TRASTLE—
 J. BIESECKER.
 To 2d Brigade: 705—609—533—PITZER S.H.
 All walkers to SSW MIEDLEY CROSSROADS (1 mi'e SW HILL 765) Able to
 walk to base thence by trucks to corps hospitals at crossroads 630.
 All other cases to sorting hospital.
- V. CLASSIFICATION:
- Routine.
- VI. EVACUATION:
- By corps.

2. It is recommended (a) that all empty trucks en route to railhead stop at Miedley crossroads for transportation of slight cases en route to 611.

(b) That one company of labor troops be provided with the following tools and transportation: 75 shovels, 8 axes, 8 field wagons and teams complete; and reported to the sanitary inspector at J. Sacks farm at H plus 4 hour on D day.

(c) That all prisoners be sent to the division collecting point via battalion, and regimental aid points and dressing stations.

X. Y. Z.
Lieut. Col. M.C.,
Surg. 1st Div.

DISTRIBUTION:

C. of S.....	1	C. Surg.....	1
G1.....	1	Sanitary Inspection.....	1
G3.....	1	C. O. Medical Regiment..	3
Med. Evac. Off.....	1	Surg. next higher unit...	1

The Plan of Medical Evacuation

325

PLAN OF EVACUATION CORPS, OFFICE OF THE SURGEON, 1 ARMY CORPS, Fairfield, Pa., 2 June, 1920.

From: Surgeon
To: Asst. C. of S., G4, 1st Army Corps,
Subject: Memorandum plan medical department evacuation to accompany
Administrative Order No. 50.

1. Below find memorandum of a plan of Medical Department evacuation and hospitalization for consideration for inclusion in the administrative order to accompany F. O. No. 50, 1st Army Corps.

This plan is based upon a probable casualty day of 10 per cent of divisional troops. Casualties of corps troops will not be great and they are provided for by the divisions near which they serve and by the corps medical regiment.

<i>Organization and location</i>	<i>Number of Units</i>	<i>Classes of cases and function</i>
I. COLLECTION—EVACUATION:		
(a) Nothing.		
(b) Ambulance Cos.	6	
Vicinity CROSSROADS 611.	1	Evacuation from field and surgical hospitals to evacuation hospitals.
Vicinity CROSSROADS 665.	1	Same.
Vicinity CROSSROADS 623.	1	Same.
Vicinity CROSSROADS 616.	1	Same.
Vicinity CROSSROADS, 616. (S of FAIRFIELD)	1	Same.
Vicinity of Hagerstown.	2	Movement of patients between evacuation hospitals and hospital trains.
(c) Sanitary Cos.	6	Litter bearers.
Report to C. O. of evacuation hospitals.	1 each	
II. HOSPITALIZATION:		
(a) Evacuation hospitals.	6	
Vicinity Virginia Mills (Zone of 1st Division)	1	Seriously wounded and sick except gassed and contagious.
Vicinity CROSSROADS 665 (Zone of 2d Division)	1	Same.
On track packed in vicinity of Hagerstown.	4	Will reconnoiter vicinity for means of shelter and establishment—will not establish until ordered.
(b) Surgical hospitals.	3	
Vicinity FAIRFIELD (Zone 1st Division).	1	Nonevacuable cases.
Vicinity CROSSROADS 665 (Zone of 2d Division).	1	Same.
Vicinity CROSSROADS 617.	1	In readiness to move will not establish until ordered.

- (c) Hospital Cos. 1st Corps, Med.
Reg. vicinity CROSSROADS 630.

3

1 gasses cases, 1 slightly
wounded, 1 slightly wounded and
contagious.

III. SUPPLY:

Medical Supply Section 1st
Corps Med. Reg. Vicinity
CROSSROADS 630.

Issue to corps and divisions.

VII. VETERINARY SERVICE:

Veterinary Co. 1st Corps Med-
ical Regiment.
Vicinity CROSSROADS 630.

Animal evacuation.

See veterinary plan.

IV. ROUTES AND DESTINATIONS:

Movement of ambulances in corps areas north and south via corps lateral road, slightly wounded, slightly sick, contagious and gas cases (to be evacuated) to corps hospital companies at CROSSROADS 630.

Nonevacuable to surgical hospitals.

All other cases to evacuation hospitals.

V. CLASSIFICATION:

Routine.

VI. COLLECTION—EVACUATION.

By corps to surgical and evacuation hospitals.

Final evacuation by hospital trains.

2. It is requested that six hospital trains be secured and held for evacuation.

X

Colonel, Medical Corps.,

Surgeon, 1st Army Corps.

DISTRIBUTION:

C of S.	1	Med. Evac. Off. (corps or army)	1
G1.	1	Surg.	1
G3.	1	San. Insp.	1
G4.	1	C. O. Med. Regt.	3
Surg. next higher unit.		1	

PLAN OF EVACUATION TRANSLATED INTO FIELD ORDER OF MEDICAL REGIMENT
ON ASSUMPTION THAT DRESSING STATION DETACHMENTS AND
EQUIPMENT ARE PART OF SANITARY BATTALION

1ST MEDICAL REGIMENT,

Fairfield, Pa., June, 1920—12.00 noon.

FIELD ORDERS NO. 30.

MAPS: Gettysburg Antietam 3"—Gettysburg, Knoxlyn, Fairfield Sheets.

1. The enemy consisting of one corps of three divisions is entrenching on the line CULPS HILL, CEMETRY HILL, ROUND TOP. He has no other troops within supporting distance.

Our entire I Corps is now east of the BLUE RIDGE.

The 1st Division will attack the enemy position, with the I Corps at H hour.

Position components I Corps: Cavalry, right and left flanks, 3d Division; reserve, concealed position vicinity GREENMOUNT. 1st and 2d Divisions on line right to left.

Corps medical regiment CROSSROADS 630. 1st Surgical Hospital vicinity FAIRFIELD.
1st Division:

Line of departure: Hill 547 (348.6-744.2)—Hill 561 (349.0-745.4)—Hill 587
(348.3-746.4)—Hill 584 (348.6-747.2).

South boundary: CROSSROADS NE of FAIRFIELD—CROSSROADS 604 (339.3-
743.6)—DIEHLS MILL—MCGREARY S.H.—CROSSROADS 549
(350.3-743.3) * * * * * all inclusive.

North boundary: CROSSROADS 630 (337.2-748.2) exclusive—CROSSROADS 688
(339.9-744.1) exclusive—CROSSROADS 558 (341.7-747.6) exclu-
sive—CROSSROADS 475 (344.6-747.6) exclusive—J. SMITH in-
clusive—Hill 592 (350.1-746.5) inclusive—GEO. SPANGLER in-
clusive * * * * *

West boundary: Corps lateral road, Road 616—598—630—679—ORRTANNA.

Interior brigade boundary: North boundary 1st Brigade—CROSSROADS 613—
705—639 (342.7-745.7)—VINCENT SPUR (349.6-745.0)—DIENER
FARM (350.5-744.3) all exclusive * * * *

2. This regiment will cover the sanitary service of the 1st Division, in the attack.
One company of each battalion will be held as division reserve.

3. (a) Collection:

<i>Organization</i>	<i>Number of units</i>	<i>Classes of cases and function</i>
1. Sanitary Battalion.	1 det	Establish station for slightly wounded; MIEDLEY CROSSROADS, (1 mile southwest of Hill 766 at H minus 4 hours.
2. Sanitary Battalion.	3 cos	
Vicinity house 300 yds S.E. of H. E. Boyd.	2	Cover division collection.
Dressing stations vicinity WIL- LOUGHBY RUN west of J. BIE- SECKER farm at H minus 5 hour and Pitzer SH at H minus 5 hours.	1 less det 1 1	Division reserve. Cover zone 1st Brig. Cover zone 2d Brig.

3. Ambulance Battalion.	3 cos	
Vicinity house 300 yds. S.E. of H.E. BOYD at H minus 4 hours	2 1	Cover division collection Division reserve.

(b) Hospitalization:

Reg. Hq. service Co. and hospital battalion vicinity CROSSROADS 583 at H minus 4 hours.	3 cos 2 1	Establish sorting and gas hospi- tal Division reserve.
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4. (a) SUPPLY:

Med. Supply Section vicin- ity CROSSROADS 583 at H minus 4 hour.	1	Supply, Corps supply point CROSSROADS 630.
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(b) ROUTES:

Ambulance routes.

To 1st Brig: MIEDLEY CROSSROADS—568—MCGREARY S.H.—TRASTLE—
J. BIESECKER.

To 2d Brig: 705—609—532—PITZER S.H.

(c) DESTINATIONS:

All walkers to station for slightly wounded MIEDLEY CROSSROADS (1 mile SW HILL 766).

All other cases to sorting hospital.

(d) CLASSIFICATION:

Routine.

(e) EVACUATIONS:

By corps.

- (f) Veterinary Service; Veterinary company: Vicinity CROSSROADS 580 at H minus 2 hours. 1 Animal evacuation.

5. Messages to me at CROSSROADS 583.

X. Y. Z.

*Lieut. Colonel, Medical Corps,
Commanding.*

DISTRIBUTION:

C. of S.....	1	Regtl. hq.....	3
G1.....	1	C. O. bns. each.....	4
G2.....	1	C O M S Section.....	1
G3.....	1	C O M L Section.....	1
G4.....	1	C O S Co.....	1
Corps Surg.....	1	C O V Co.....	1

Renumbered in order to comply with requirements for numbering field orders.



FACTORS MAKING FOR A HIGH VENEREAL RATE OF THE U. S. ARMY, IN CHINA

CAPTAIN IVY A. PELZMAN
Medical Corps, United State Army

IN THE MILITARY SURGEON for August, 1920, Col. P. M. Ashburn, Medical Corps, U. S. A., published a study of factors making for a low venereal rate in the Army, in the United States. To me this study proved most interesting, and with a view of making a comparative study of the conditions in China, I made a similar inquiry here.

The collection of this data was preceded by a talk to the men impressing upon them the necessity for being truthful in their statements. As in Colonel Ashburn's inquiry, I explained to the men the reasons for which the information was sought, to assure them of their absolute freedom to answer or to refuse to answer any or all questions and to conceal their identity so that they could not be brought to account for any answer.

The inquiry was limited to conduct within a period of six months because of the fact that about 400 men have joined the command during the past six months. At this writing the strength of the command is 1,210; 1,061 replies to the questionnaire were received.

CHASTITY

The percentage of the men who had been chaste for a period of six months was 11 per cent as compared to 34 per cent in the United States for a period of one year. Had this inquiry been conducted covering a period of a year instead of six months, I feel quite certain that the percentage of chastity would have been smaller. This low rate of chastity exists in spite of a most active campaign to interest men in vocational training and also frequent athletic meets and games given with a view of interesting the men in clean sports. The usual anti-venereal moving pictures have been shown, and talks to the men on the dangers of venereal diseases have been given at frequent intervals. There are many reasons which tend toward making the percentage of the chaste so low as compared to the troops in the United States. Conditions in China are entirely different from those in the United States; here the soldier has no American homes where he can visit, he has no American girls to associate with, and, most important of all, the cost of intercourse is so low that it comes within the reach of all, and can be made a past-time. From a study of the weekly venereal reports it is shown that the average paid is from 40 to 60c. U. S. currency. These reports likewise show that in spite of the fact that prohibition does not exist

here in China, that the indulgence in alcoholics does not materially tend toward an increased venereal rate; it is the exception rather than the rule that the venereal histories show that a man had been drinking previous to intercourse; however, I feel that there are a few men who after indulging in a few drinks engage in illicit intercourse, whereas had they not been drinking they would not have exposed themselves.

FREQUENCY OF INTERCOURSE

The 920 men who admitted illicit intercourse during the 6 months' period acknowledge 15,207 sexual contacts, an average of 16.5 for each man per 6 months, as compared to 28 per man for a year in the U. S. Here, too, I feel that had this inquiry been conducted six months hence, covering a period of a year rather than 6 months, it would show a higher rate of sexual contacts. They admitted 246 venereal infections, thus showing that 26.4 per cent of all men indulging in illicit intercourse became infected in the course of 6 months, and that there was one infection for each 65 illicit contacts. In this series there were 3,079 instances of neglect of the use of prophylaxis and 52 acknowledged infections following the neglect of it, or one infection in 59 exposures without prophylaxis. There were 12,218 exposures followed by the use of prophylaxis and 194 infections following its use, or one infection for 62 exposures with prophylaxis.

TABLE OF COMPARISON

U. S. Army in the United States covering a period of 1 year		U. S. Army in China, covering a period of 6 months
Percentage of chastity.....	34.0	11
Average exposures per man.....	28.0	16.8
Percentage of infections.....	7.4	26.4
Infections following use of prophylaxis.....	1-220	1-62
Infections following failure to take prophylaxis.....	1-305	1-59

DISCUSSION

From a study of these figures it is quite apparent that illicit intercourse in China is considerably more dangerous than it is in the United States. In Colonel Ashburn's figures he shows that there was one infection for each 220 illicit contacts as compared to one in 65 contacts in China. The percentage of chastity among the troops in China is 11 per cent for 6 months as compared with 34 per cent among the troops in the United States, covering a period of one year. This small

percentage of chastity, of course, tends to increase the venereal rate here, because a study of my figures shows that 26.4 per cent of the unchaste become infected in the course of 6 months as compared to 7.4 per cent in the United States for a period of a year.

Relative to the subject of prophylaxis it was shown that 1 in 62 infections of venereal disease following prophylaxis and 1 in 59 developed venereal disease following failure to take prophylaxis as compared to 1 in 220 and 1 in 305, respectively, in the United States. Numbered in the group of men who do not take prophylaxis are a few soldiers who are living with "squaws," either Japanese or Chinese; this group never take prophylaxis and if I were able to deduct this class from my figures I feel sure that the venereal rate following exposure without prophylaxis would be higher than 1 in 59.

As to the value of prophylaxis I am still of the opinion that it is the one adjunct we have at our command in lowering the venereal rate—it is true that glancing at the figures alone one can see very little difference between 1 in 62 infections following prophylaxis and 1 in 59 infections without prophylaxis but closer investigation of those cases developing venereal disease following prophylaxis bring out the fact that these men either delayed taking prophylaxis until several hours after exposure or else that they took it in a perfunctory sort of a way. I do not maintain that prophylaxis is a 100 per cent preventative and I do believe that the claims for prophylaxis have been perhaps exaggerated somewhat and that perhaps it has given the enlisted man a false sense of security. However, I am sure that had the men who became infected after prophylaxis, taken it earlier and properly, the number infected would have been much less. In impressing on the enlisted men the value of prophylaxis it is important to lay great emphasis on the time element, that the value of prophylaxis decreases as the time elapsing after exposure increases. Furthermore they should be carefully instructed as to the proper manner to take prophylaxis, and it is most important to have the prophylaxis room in charge of one who knows how to administer prophylaxis properly. Since joining the command, two months ago, I have in talks to the enlisted men featured the idea of promptness and correctness in the administration of prophylaxis. Since these talks I have been gratified to observe a slight decline in the venereal rate.

Unfortunately here in China the American Compound is located some distance away from the section of the city where most of the houses of prostitution are located—as a result it takes about one hour by rickshaw before a soldier can return to take prophylaxis, provided he returns to the Compound immediately after exposure. This factor

alone to my mind accounts for the fact that so many men acquire venereal disease after prophylaxis. Because of the location of the houses of prostitution in the various sections of the city it is impossible to establish prophylactic stations in each section.

The venereal problem in the China Expedition is not only a difficult one but also a serious one—Tientsin, where all but two companies of the 15th Regiment are stationed, is a city covering an area of 25 square miles. It has a population of 904,400 people of which 900,000 are Chinese. The morals of the Chinese as a whole are not very high—there are a large number of houses of prostitution situated in various parts of the city. To put these houses out of bounds would mean to practically put the entire city out of bounds—it would likewise necessitate virtually the entire regiment being placed on provost guard. The women are notorious for their lack of cleanliness and it is safe to say that practically all of them are venereals, and if it were not for the protection that prompt and properly administered prophylaxis affords, the venereal rate would be considerably higher. The Commanding Officer of the 15th Infantry having no authority over the various foreign concessions of the city, it is of course impossible to remove the source of the infection by apprehending, detaining, and medically treating infected women, and they thus continue on in their trade, being a constant menace to the command. There are 8 foreign concessions in the city each acting independent of the other insofar as its local government is concerned.

To my mind the only solution is the establishment of a segregated district under military control, where the women before becoming inmates shall undergo thorough preliminary examination for venereal diseases. The women to be given a thorough examination at frequent intervals, not the usual perfunctory kind, but a most careful one; they should be instructed, and it should be insisted upon, that after each intercourse they should take a prophylactic douche. With thorough and careful inspection of women, prophylactic douches by them, and prompt and properly administered prophylaxis by the men at a prophylactic station established in the segregated district, chances for infection will be reduced to a minimum.

Many of course, will object to these views and state that these steps will encourage illicit intercourse—however, as my figures show, here in China encouragement enough is already offered the enlisted man for illicit intercourse, and I feel quite sure should we have a regulated segregated district it will not materially decrease the number of chaste men, but it will offer a safe place for those who indulge in illicit intercourse. Even granting that it might slightly increase the number of exposures, I feel that the advantages that this plan will offer will far

outweigh this one possibility that it might slightly increase the number of exposures. Everything that can be done by way of anti-venereal talks and pictures has been used in an effort to instruct and inform the men as to the dangers of venereal disease here; they have seen many of their fellow soldiers infected and many of them have become infected themselves, yet they continually "take a chance." Granting that by far the majority of the men will indulge in illicit intercourse it is to my mind the next best thing to make it as safe as possible for them, and in China, where we have no authority to remove the source of infection the only solution seems to be segregated district under military control.



CASUALTY CLEARING STATION.

LECTURE BY LIEUT. COL. A. H. SAFFORD, R.A.M.C.

(At the Army Sanitary School at Langres.)

(With two illustrations)

THE ideal casualty clearing station should furnish hospital accommodations for sick and wounded as near the front line as possible, and evacuate those to be taken to the rear as rapidly as possible. It should be reasonably safe from the major part of battle fire, although it can never be safe from airplanes or a deliberate attempt of the enemy to shell it, which would have to break all international conventions. Casual shells and deliberate attempts of the enemy to destroy such a hospital can thus not be provided against. This hospital is a sorting place for wounded and is the best place where it can be done because here only can seriously wounded be placed immediately under surgical conditions. General Thompson has shown that organizations near the front and under shell fire can not operate on seriously wounded with a degree of precision and surety of good after-treatment commensurate with the risk involved. In running the casualty clearing station one should always keep in mind that the lines of communication must be kept clear. Ordinarily it should be the object of the casualty clearing station to retain all slightly wounded who can return to duty, or, in other words, those who require not more than two weeks treatment, as well as those who can not be moved without risk to life. If necessary, the slightly wounded can, after operation, be moved to a rest station near by, which should have accommodations for 400 in an army corps of 60,000 men. In a push the C. C. S. affords a means of rapid surgery and evacuation to the rear to relieve the front line. This station should also be utilized to heat, feed and dress wounded, if nothing else. Therefore, a casualty clearing station must be looked upon as a sieve, sorting cases into three types:

1. Those requiring immediate operation,
2. Those for forwarding that can be transported to the rear, and
3. Those to be retained (minor cases) for treatment.

As a rule, in a push, only 25 per cent of cases are operated on here and, of course, these comprise those most urgently needing it. A. C. C. S. can admit 400 to 500 a day under battle conditions, and one of these stations had 2,800 men pass through it in five days (Vimy Ridge). In periods of inactivity 70 per cent can be attended to here. It is best to group two or three casualty clearing stations, allowing them to alternate in receiving patients. In this army they are situated from three to six miles back, but it is stated there is a general order about to be

issued forbidding their being placed nearer than twelve kilometers. They are generally on a railroad, but there is one which has a four-mile carry by motor to the rail head. This needs good roads. This grouping is economical of lines of communication, of X-ray installation, and of laboratories, as well as of water, light and fuel.

Surgeon General Cuthbert Wallace is really the father of the idea that patients should be kept at the front in a C. C. S. and provision made for this purpose. The principal object of holding men at the C. C. S. who can soon return to duty is that when they pass beyond this station they are lost to the division, and the same man never comes back to his regiment as his place is immediately supplied by replacement. It is necessary that patients should pass in a steady stream, coming in one direction to avoid congestion. The ideal plan of such a hospital is seen in Figure 13.

A central road divides the casualty clearing station into two portions,—one for the reception of sitting patients and one for recumbent patients; or as the English have it, "One for sitters and one for lyers." All classes requiring immediate operation are lyers.

Taking first the sitters: They are admitted to the sitting reception room, which is well heated, where hot drinks and soda are distributed. Their record is taken here from the medical diary hung on a buttonhole, begun by the field ambulance, either at the A. D. S. or M. D. S. This is called by the English, "Taking a man's particulars." From it and from the statements of the patient a yellow slip is made out giving name, regiment, diagnosis, and a serial number referring to the records of the casualty clearing station. This ticket has a perforated separation into two parts, each of which contains the same information. One goes to the record office of the C. C. S. and the data is entered in the Admission and Discharge book. The other (the stub) is pinned on the envelope of the medical diary hanging on the buttonhole and bears the casualty clearing station's number of the patient.

These sitters are divided into those requiring dressing and those needing food and heat who can be immediately evacuated thereafter. Such patients are not given a bed as they are not to stay. Here the man's kit is taken away from him and he is given a receipt for it. It is sent to a non-commissioned officer at the pack store and placed in a cubby-hole in a stand, bearing the man's number. His valuables, however, are put into a "Dorothy bag" and accompany him wherever he goes.

From the reception room he enters the dressing room where all small wounds are cared for. Here an experienced surgeon should be on duty to pick out cases needing operation which have slipped through. He is

then sent to a bath, but if he can not bathe himself he is bathed in bed. After bathing, new underclothes are issued to him, and during his bath his outer clothing has been disinfected and is ready for him when he comes out. His dirty underclothing is disinfected, washed and turned in to the quartermaster for reissue to others. Those destined for the wards are sent there. Those not to stay are sent to wait for a train to the rear or for other transportation to a rest station near by.

The Recumbent Cases.—Their reception room should be large and should accommodate fifty patients. It should be well heated. The kit is also taken from the patient and it is marked with his number by means of a check and sent to the pack store. All blood-stained or irreparably injured clothing is destroyed. Here there should be a very experienced officer of good judgment to make a quick decision as to whether an operation is needed or not. If it is, the man goes to the pre-operating ward administered by a nursing sister. His clothes are removed and handled as for the sitters. He is now warmed up, either by the blanket system or hood heated by electric lights. There should be a team in charge of this room to decide *when* a man is fit to operate on, and the *sequence* of the patients for operation according to urgency of their case. As it is next to the operating room the operator can have a say in this decision. He is given morphine here and intra-venous injections of gum arabic and sodium bicarbonate if necessary, or salt solution per rectum if the case is not sufficiently urgent to demand intravenous injection. From here he is sent to the X-ray room, which is connected (as is the sterilizing room) with operating rooms on either side of it.

The Operating Room.—Here the surgeons work in teams consisting of: 1 surgeon, 1 nursing sister, 1 anesthetist, 1 clerk (to take down notes of operation), 2 orderlies, and 3 bearers. Each team has two tables, as per Figure 19, and there are three teams working in the same room. There is an instrument case, dressing case, and an instrument table for each team, as well as two operating tables. Their space is sixteen feet wide. The instrument table is placed between the two operating tables. This space is separated from an adjoining one by a long screen or partition. Within the space there is another screen of smaller size which is moved to the side of a table where the patient is being anesthetized to screen him from sight of the instruments and of the operation going on next to him. For instance, while the operator is finishing his operation on one patient this screen is next to the table upon which the next patient is being anesthetized and, of course, to the other side of the instrument table. When the operation is completed and the patient is removed the space is cleaned up, the instrument table renewed for the next patient, and the position of the screen is reversed,

being placed at the side of the first table for the next case. This is economical of equipment and allows operations to proceed rapidly and in an orderly manner. Each table can take care of 20 to 25 cases a day; and by using three teams by day and two by night, 128 cases can be handled in twenty-four hours.

In time of action in any part of the line the interested C. C. S. is reinforced by additional teams from other hospitals nearby. To this end Captain Cowell has devised a portable operating outfit to go with the team, which is kept packed and ready at all times. Usually in a casualty clearing station there are from six to ten teams on hand that work in twelve-hour shifts. This was considered better than eight-hour shifts. If the patient can be evacuated he is sent to the first empty bed nearest the train, but some are sent to the special wards for serious cases not to be transported. Every casualty clearing station has bed wards and stretcher wards. Stretcher wards are wards fitted up with supports for litters, upon which litter patients are placed awaiting transportation.

Before entering into the operating room—and in fact with all wounded before evacuation—anti-tetanic serum is given if it has not already been administered. All over the English army, as soon as this serum is given a “T” is marked on the forehead with indelible pencil. The English emphasize the great necessity of having these operating rooms warm, as well as their dependent rooms, and in addition to hot drinks and heating under hoods most cases get food in addition to liquids. Anti-tetanic serum is given once a week to every man who is kept at the hospital after operation until he is cured. It is noted that a Nissen hut makes an excellent operating room.

In addition to special wards for serious cases to be kept at the hospital special wards should be provided for cases of gas gangrene. In the first place, they should be treated as infectious cases; secondly, they give rise to a great deal of foul odor; and, thirdly, are gravely ill as 90 per cent die. These wards should be separated from the rest. Another ward should be for gas cases. There should be wards for minor cases, and a consulting internist is badly needed to look after them. In fact, the British deplored the lack of a consulting physician for their casualty clearing station. In the summer time gas cases should be left in a shed protected on all sides save one to get the largest amount of aeration possible. There must, also, be an officers' ward. It is noted that it is best to load an ambulance with four recumbent patients and two sitting, so that the latter can act as assistants in case of emergency en route. Two wards are for convalescents; and in addition to the fact that such men are given a longer time to recuperate they can

also be useful in the hospital where the personnel is always insufficient. Every casualty clearing station should be capable of being expanded to a thousand beds.

Evacuation.—When a patient is ready to be evacuated the surgeon writes on the buff slip, pinned to his diary as described, the letters "E.L." or "E.S."—evacuation lying or evacuation sitting, as the case may be, and the D.D.M.S. makes the necessary arrangements for the transportation by train or ambulance. When this requisition is made for transportation there is stated not only the number of cases to be transported recumbent and sitting, but the number of cases requiring Carrel treatment, the number of infectious cases, and the number of mental cases. The orderly officer is charged with the duty of deciding whether or not the patient can be taken from the ward for transportation. The slip is taken from the card when he is evacuated and the date of evacuation is immediately entered in the Admission and Discharge book. Only the orderly officer can give the order to evacuate, and the medical officer at the train checks on him before putting the man on board.

When loaded on the train receipt must be taken for all documents and articles delivered to the C.O. of the train. Telegraphic advice is given of the number and kind of cases on the train. There are wards for stretcher cases as well as wards for sitting patients. When men are sent to duty from the hospital the R.T.O. (Railway Transport Officer), is notified what transportation will be required, giving rank and date. Every casualty clearing station has a storehouse which keeps at least 50 complete sets of clothing and field equipment, which are cared for and kept in good condition. Each man gets a bath, his clothes and ten days' rations before he goes.

It should be remarked, additionally, that all officer patients are required before leaving to sign a paper stating that they have received all of their equipment and valuables brought to the hospital, as it is frequently a cause of serious difficulty if omitted. A dentist is usually made entraining officer.

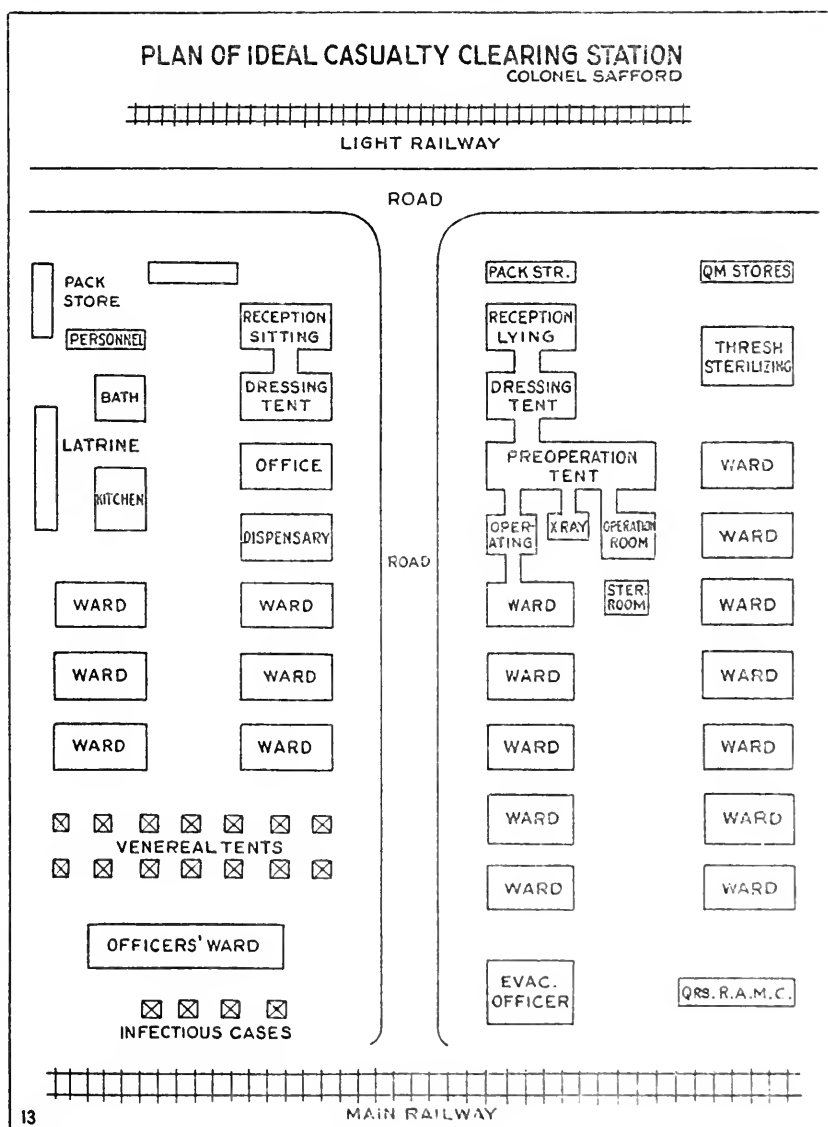
Sanitation.—The particular kind of hut used is of importance. The Nissen hut costs 50 pounds and accommodates 20 patients, while the square marquee tents costs 120 pounds and can accommodate only eight patients.

Every C.C.S. should have a Thresh disinfecter. The MacPherson system of latrines was favored by Colonel Safford but should be installed to serve only a highly technical unit like the casualty clearing station. This requires, of course, an incinerator.

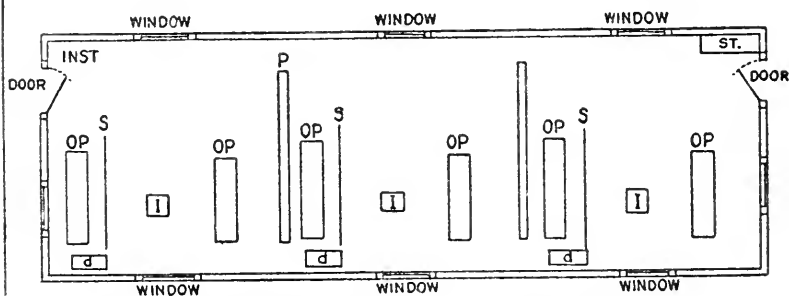
The personnel of a casualty clearing station consists of the following:

1 commanding officer (usually a lieutenant colonel), 6 medical officers (usually captains), 12 nursing sisters, 3 chaplains, and 87 other grades (enlisted)

In addition to the convalescents noted as being of use in assisting around the casualty clearing station, it has been the policy of late to assign sixty to eighty venereal cases to aid in police and routine duties. Every C.C.S. should have a mortuary and a cemetery.



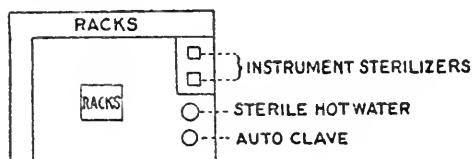
PLAN OF OPERATING ROOM-C.C.S.No.23.



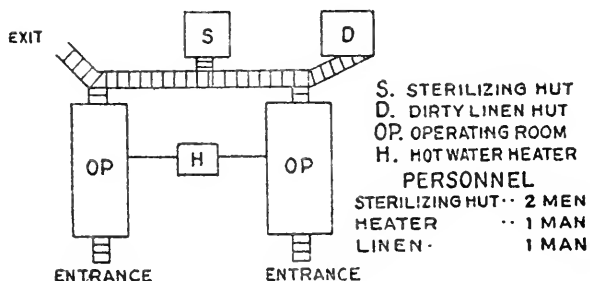
INST. INSTRUMENTS IN CASE
D. DRESSINGS, ETC. IN CASE
I. INSTRUMENT TABLE

P. PARTITION
OP OPERATING TABLE
S. SCREEN

STERILIZING HUT-C.C.S. No. 30.



OPERATING PLANT-C.C.S.No.30.



TONSILLECTOMY IN THE MILITARY SERVICE— COMMENT ON INDICATIONS, TECHNIQUE, AND AFTER TREATMENT

BY MAJOR ROYAL REYNOLDS

Medical Corps, U. S. Army

MEDICAL literature has dealt extensively with the tonsil in recent years. The rôle of the tonsil as a source of infection is pretty well known. New methods of tonsillectomy and modifications thereof are daily extolled. One, therefore, is reluctant to add his contribution to the subject, yet there are phases of the subject peculiar to the military service and there are medical officers more actively engaged in other lines of work, who may profit by the experience gained in one of our large hospitals.

During the writer's eighteen months' service in the Eye, Ear, Nose and Throat Section at the Letterman General Hospital, there have been approximately one thousand tonsillectomies. Certain observations have been made and conclusions formed, particularly as to technique of operation, that should be of practical value to medical officers of the service.

INDICATIONS FOR TONSILLECTOMY

The indications for tonsillectomy will not be discussed in detail. We have observed the benefits of the procedure and are inclined to place little stock in what is now being referred to as "the swing of the pendulum" and the "ruthless sacrifice of the tonsils." Tonsils in children are sometimes ruthlessly sacrificed, no doubt, but when one condemns tonsillectomy he should be specific and tell wherein and in what particular cases we are over-zealous in the war on the tonsils. Judgment and discretion are required in advising as to tonsillectomy, as in any other contemplated surgical procedure. In very young children, in the tuberculous and in cases suspected of focal infection, this is particularly true. But in a general way it can be stated that as regards the health of individual soldiers and as regards the control of certain infectious diseases, the military service would be benefited by a greater resort to tonsillectomy. Nichols and others have demonstrated in the laboratory the futility of attempts to eliminate tonsillar infection other than by tonsillectomy. The streptococcus haemolyticus lurks in the tonsillar crypts and a negative throat culture does not mean freedom from infection. It is probably true that there are strains of the streptococcus haemolyticus of varying degrees of virulence and like-

wise that 50 per cent of our soldiers harbor infection. To tonsillectomize 50 per cent of our soldiers is, of course, not logical. But in a case of known virulent infection of the tonsils, we believe tonsillectomy to be indicated after the acute symptoms have entirely subsided. Many a soldier leaves the hospital "cured" of an acute follicular tonsillitis, Vincent's Angina, or even diphtheria, only to transmit his infection to other men in his organization and to return at a subsequent date with a recurrence of his trouble. It may seem to some a rather radical procedure to enucleate the tonsils of all soldiers admitted to our military hospitals with tonsillitis, but this is advised in our cases, with an occasional exception. Patients with tonsillar infection from streptococci, Vincent's organisms and diphtheria are retained in the hospital or returned to the hospital for tonsillectomy when such can be done with safety to the individual. The soldier is thereby kept one week from the performance of his military duty. We believe that the individual soldier is better off and his fellow soldiers safeguarded to some extent by this policy.

ANESTHETIC

Laryngologists, particularly those having had military service, are generally convinced that local anesthesia has decided advantages over general anesthesia, both to the adult patient and to the operator. Certainly no one maintains otherwise for our soldier patients. The writer has encountered no adult in over five hundred cases operated by him who was found intractable or impossible to complete under local anesthesia. Incidentally, it may be stated that this number included many women patients who invariably behaved as well or even better than soldiers. Occasionally, a case is encountered when enucleation is difficult because of dense fibrous adhesions between the tonsil capsule and the peritonsillar tissues, the result of severe infection or an old peritonsillar abscess. Even these cases can be done better under local than under general anesthesia.

By closely following the technique to be described, the operation is without pain and practically bloodless.

TECHNIQUE

Tonsillectomy aims at the complete enucleation of the tonsil including its capsule with a minimum of injury to surrounding structures. Any incision or manipulation or step in an operation which denudes the faucial pillars of their protective epithelium, leads to subsequent ulceration and soreness during convalescence. Any step which sacrifices mucous membrane or muscular tissue of the pillars or muscular tissue of the superior constrictor muscle of the pharynx underlying the

tonsil results in scar formation, subsequent distortion of the fauces and impaired function.

By the following method we believe these ill effects are obviated:

The patient having been given a laxative the night before and no breakfast, is seated in a straight back chair and draped with a sterile sheet. The pharynx is sprayed with a 4 per cent cocaine solution and a 10 per cent solution is applied to the tonsils and pillars. It is possible to use too much cocaine solution here. It should be carefully applied and not swabbed promiscuously in the throat, for at times it may so paralyze the throat muscles and pharyngeal reflex as to interfere with expectoration and give the patient a sensation of suffocation. After a few minutes delay, 10 to 15 c.c. of a $\frac{1}{2}$ per cent novocaine or procain solution to which has been added one adrenalin tablet, are injected into the pillars and tonsils. Usually not more than 10 c.c. are required. The needle used should not be too long nor should great force be used, as there is danger of inserting infected material into the deep cervical structures with resulting abscess formation. The needle is first inserted through the middle of the anterior pillar, its point being kept outside the tonsil capsule. About 1 c.c. is injected while gradually inserting the needle. Similar injections are made, one just above the tonsil, and another through the plica triangularis, the inferior reflection of the anterior pillar. Three injections are made in the tonsil itself—one in the upper third, one in the middle, and a third well down in the lower pole of the tonsil. These injections are made by inserting the needle in the tonsil until the resistance of the capsule can be felt and then injecting about 1 c.c. of the solution. The right tonsil is first anesthetized, and then the left, when the operator may proceed at once with the enucleation. The operator takes an angular knife (Douglas tonsil knife) in his right hand, enters it at the base of the anterior pillar through the plica triangularis and well outside the tonsil capsule. It is then brought up, severing the mucous membrane of the anterior pillar exactly at its union with the tonsil proper. The incision is carried up along the anterior pillar, over the superior pole of the tonsil and down along the posterior pillar, always hugging the tonsil as closely as possible. With great care and certainty a small grasp is taken of the upper pole of the tonsil, always including capsule. This is the most difficult and important step in the procedure, and can best be accomplished with Robertson's tonsil-grasping forceps. The instrument should be held in the right hand for the right tonsil and in the left hand for the left tonsil. One blade of the forceps is carefully inserted in a gap made by the topmost portion of the original incision, pressed well up and under the pillar, but never grasping it. At the same time

pressure is made on the other blade and traction exerted on the tonsil. Up to this point a tongue depressor is required but is no longer required during the dissection. With a tonsil knife (Beck's) in the left hand for the left tonsil, and in the right hand for the right tonsil, the pillar is carefully pushed away from the forceps until the capsule comes into view. If a part of the capsule is seen to be in the grasp of the forceps, the rest is easy sailing. Beck's knife is used to push first the anterior pillar from the capsule, then the posterior pillar, and finally the remaining attachment along the "back" of the tonsil. During the enucleation the knife and forceps may be changed from hand to hand. The writer usually changes the knife to his right hand for the posterior pillar of the right tonsil and to his left hand for the posterior pillar of the left tonsil. When the tonsil has been freed just as far down as possible and hangs by a very small pedicle, the wire loop of a snare is passed over the forceps, and around the tonsil. A little upward traction is then exerted on the tonsil with the forceps and the tonsil is quickly snared off. The slight upward traction on the forceps is important in that it allows the wire to pass around the lower pole of the tonsil and not through the tonsil tissue. Before the patient leaves, both sides are carefully inspected for bleeding and for remnants of tonsil tissue. It is the exceptional case that bleeds so much as to even obscure any step in the operation.

As a rule the operation requires ten minutes—five for the administration of the novocaine, and five for the enucleation. We believe this operation has the following advantages:

1. The complete enucleation of the tonsil can be done quickly, neatly and simply.
2. No tongue depressor or holding down of the patient's tongue by an assistant or by the patient himself is required during the enucleation.
3. Small strands of tissue can be carefully and accurately released with less danger to surrounding structures and with less bleeding. The knife is far better for dissecting the capsule free than blunt dissectors.
4. The position of the grasping forceps can be quickly removed and reapplied at will during the enucleation.
5. There is no injury to the pillars, not even denudation of their epithelial covering. Subsequent ulceration and "soreness" is confined entirely between the pillars.

POST-OPERATIVE TREATMENT

The patient walks back to the Ward, is given morphia, 16 mgm. hypodermatically and put to bed with an ice bag to his throat. He is kept in bed for twenty-four hours and in the hospital for one week.

Soldiers should not be marked duty until a week has elapsed. In civil practice, patients are allowed to go home after twelve or twenty-four hours, but in the case of the soldier, there are certain dietary difficulties which he would encounter with the army ration at his company, and his retention in the hospital is required until the sore throat period has passed. A cleansing mouth wash of hot normal saline or Dobell's solution is ordered for the second and succeeding days. A measure which we have found to be soothing, cleansing and of decided benefit to very sore throats is a hot saline irrigation given with an ordinary fountain syringe or irrigating can. A stream of the solution, using a pint or more under low pressure, is allowed to play on the inflamed tissues. Healing is always by second intention with a certain amount of infection. For the first three days the throat is quite sore, particularly when the faucial muscles are brought into play by swallowing. The infection and soreness subside gradually after the third day and seldom is it necessary to retain a soldier in the hospital for more than one week.

HEMORRHAGE

Post-operative hemorrhage does occasionally occur with every operator. It usually occurs within the first twenty-four hours. At times hemorrhage may appear rather alarming, but we have yet to encounter a case in which it was not readily controlled. It is our belief that experience and careful technique render tonsillectomy a much less dangerous procedure as regards hemorrhage than is the prevalent belief in the minds of medical men not actively engaged in this work. Post-operative hemorrhage is extremely rare in children. In over two hundred tonsillectomies in children we have had no case requiring even so much as a summons from the nurse because of bleeding. It is, however, more frequent in adults, but Mosher reports but one death from hemorrhage out of fourteen thousand and forty-two tonsillectomies during the war.

CONTROL OF HEMORRHAGE

Our usual procedure is to give a hypodermic of morphia to quiet the patient and then with reflected light to examine the throat. Usually there is one of two conditions causing the bleeding—either a large blood clot filling the tonsil fossa under which is a bleeding vessel or the tonsil has not been completely enucleated and an oozing remnant remains. In the latter case the bleeding may have been going on for some time, the blood slowly oozing from a remnant of tonsil tissue as a rule near the base of the tongue, and seen only with difficulty. The patient is not conscious of the slow trickling of blood down the esophagus and the

nurse is aware of it only when the patient becomes nauseated and vomits an alarming quantity of blood. Having determined the cause of the bleeding, several measures may be tried. If the fossa is filled with a blood clot, the clot should be removed and the bleeding point located. As a rule, the cleaning out of the blood clot from the tonsil fossa, the insertion of a small compact gauze sponge in the fossa and allowing it to remain several hours, will answer for the control of the bleeding. If not, the bleeding point should be grasped with a hemostat which is allowed to remain on for a few minutes and withdrawn, or if necessary, the vessel may be ligated. We have in several instances removed a remnant of tonsil tissue which has resulted in prompt checking of the bleeding. If for no other reason than the prevention of subsequent hemorrhage, one should carefully inspect the throat for remnants of tonsil tissue before returning a patient from the operating room. We are convinced that care in this respect greatly reduces the number of cases of post-operative hemorrhage.



DOCTORS IN UNIFORM¹

By HAROLD W. DANA, M. D.

Boston, Mass.

ALL my life I had looked upon the title of *Doctor* as something to be desired, to be revered, a mark of definite distinction, to be lived up to. In a republic where titles are few and far between, and in this latitude where Colonels are scarce, being addressed as Doctor distinguished one from the common herd. In New England the old ideas regarding the so-called "learned professions," still persist; in most communities the medical profession is still looked up to, and the doctor stands near the front in prominence, in social position, in civic welfare endeavors. Here in New England we are close enough to large cities and high-grade medical schools and hospitals so that most of us have a moderate amount of education and a certain degree of ability or we cannot continue to practice in the community. In a way I looked upon doctors as a class as above the average in intelligence.

Life at Greenleaf was an awakening in quite a few ways. The Army required for its program to include 1919, a vast number of medical officers, and these could be obtained only from among men who were already physicians. When those in the profession who were over the age limit, unfit physically, or needed at home were omitted from the list of doctors available for army service, so many of the remainder were needed for the army program that men had to be taken without too close a scrutiny of their professional fitness. The men commissioned in the Medical Reserve Corps were selected by boards all over the country, and these boards varied greatly in their standards of fitness for commission, and in the ranks given to applicants. Many of the best men in this section went into the service as lieutenants, and some of them continued in this rank until discharged. From some of the small southern towns, boys just out of medical schools, without college or hospital training, and with but a few months in practice, with no military training as an excuse, started in the service as captains. Men of medicine came to Greenleaf from all over the country, from all sorts of schools, and with all degrees of training or lack of it. After more than eighteen months of membership in the local examining board for the Medical Reserve Corps, I think that New England has a right to be proud of the class of physicians she furnished to the Army as compared with other sections.

¹ Reprinted from The Boston Medical and Surgical Journal, May 20, 1920.

Without making any invidious distinctions, for there were men of the highest character and ability coming into active service in the Medical Corps at great personal sacrifice, even after the armistice had been signed, the first year of our participation in the war drained the profession of a very large proportion of the best physicians available for service, and the quality of the doctors at Oglethorpe as a whole went steadily down hill, especially at the end.

It was early in May, 1918, when I got to camp, to start in again as a rookie after a year of active service. As a general thing, the men who had been two weeks or more in camp were very friendly and helpful to the new men in getting used to the ropes and getting their stuff arranged just so. The position of a rookie officer in a camp of this sort is peculiar, and unless one has a good deal of adaptability, serenity of temperament, and a sense of humor, it is quite trying. Actually, we were regularly commissioned officers of the Army, entitled to act as such and to wear the uniform of officers. While we were slightly to be distinguished from enlisted men, by wearing officers' hatcords and neckties, and were supposed to be saluted by the enlisted men, as far as the Training Corps was concerned, we were on the status of privates. We left off our insignia, we saluted our company officers regardless of our actual relative rank, and we performed all the duties that privates would perform, with the exception of washing our mess kits. The heartburn that some of the older men went through! One man in my barracks, a lieutenant, fifty years old, from a small town in a southern state, had been a big bug in his home town. He told me at least a dozen times that he had never before in his life had to shine his own shoes, and he was proud of the fact. He had been president of a fraternal insurance society; he claimed that he was a great surgeon; he would talk for hours about his troubles to any one who would listen; and he could not understand how any one of his importance could be so badly treated as he was. You have no idea of the fear, superstitious reverence, and actual hatred with which my barracks mates viewed the rulings of their fellow doctors lucky enough to be appointed sergeant, top sergeant, or battalion sergeant major. These rulings, of course, had to do with the routine discipline and paper work, and while the poor noncoms were actually only carrying out their instructions from above, and while all of the apparently absurd insistence on correctness in the paper work was purely for the purpose of teaching the correct method, and was itself in a way disciplinary, the men took it as personal cussedness on the part of the sergeants. I say this somewhat feelingly. When I slept in barracks I was fairly popular and had quite a few friends. Then it was discovered that I had done paper work for a year before

coming to camp, and I was made battalion sergeant major, after two weeks; and for the next two months I lost, one by one, every friend that I ever had in that camp. It was only a few days before I left Greenleaf that one of my later contemporaries was told by somebody that I was a terror when I was sergeant major. The camp life was fine, the drill was fine, unless we got some tough and heartless brute to run us around in the hot sun until our tongues hung out, and the comradeship was wonderful. There was, however, a limit to the length of time that an intelligent man relished being treated like a child. We went to bed at 9.30; we could not go to town without permission; and if Monsieur le Docteur Fizzledejug of the Transcaucasus came to camp and insisted upon telling us in fluent Volapuk of the diseases which are liable to attack trained fleas in his benighted country, we each and all of us had to offer him a tremendous ovation that evening, regardless of the date we had previously made with our best girl; failing that, we had to submit to our battalion commander in writing, the next morning, a sufficiently plausible excuse for our dereliction to escape the loss of the week-end privileges. Grandmothers' funerals did not go. It had to be pretty good stuff to get by an experienced and cankered sergeant major. Being more alert, adaptable, closer to medical school years, and inherently more military, the company instructors, battalion commanders and adjutants were, as a rule, young men. This was a source of grievance to the older doctors in several ways. The youngsters were not always polite and considerate—the old-timers resented their youth anyway—and often the instructors set a pace for drills and marches unsuited to those of us who were elderly and corpulent. The life was good, but too much of it was a great plenty. The course in theory in my time was of six weeks' duration. That would have been long enough to fit most men for their duties, and not so long as to be burdensome. There was one man in my barracks, however, a major, head of a base hospital, a good surgeon, but fifty-five years old, who had been in camp as a rookie officer for five months, awaiting the mobilization of his unit. The dear old fellow bore it all without a whimper, did his cot-scrubbing and floor-sweeping better than any man there, and he certainly did make those barracks a pleasanter place for all of us to be in. This was not an isolated instance; there were many men who had been in camp as cadets for from four to eight months, without being assigned to any job, without being sent out of camp, and, so far as we knew, without any definite reason. That sort of thing gets very monotonous. I remember another major, also head of a base unit, who came to camp in the expectation of having a special motor car and a valet to wait on him. He was compelled to keep on expecting. The

first morning of his stay—that is, on his second morning in camp—he came to setting-up drill in his best heavy serge uniform, wearing his latrine cap, as we called the dress cap, his boots, and his spurs. It was a nice warm forenoon in May. The drillmaster was in pretty good form that morning, and it was not so very long before the ornamental major looked somewhat wilted. I confess to enjoying that drill. A pleasing example of the opposite attitude was furnished by another major, also the prospective head of a base hospital, a celebrated New York orthopedist and a graduate of a Boston hospital, who accepted his position as a rookie with calm good nature.

Of course, perhaps more than any other class of educated men, doctors needed just the sort of discipline that they received at Greenleaf. As a class of men, we are not only undisciplined, but we resent having to live a routine life and having to obey some one else. In our own world at home, we are little tin gods, somewhat spoiled by our families and by our patients. We do not have to serve on juries; lack of punctuality is one of our most cherished prerogatives, and in our home lives, the world more or less revolves around us and exists in part that we may be able to practise medicine. As a result of this, the doctor does not become a soldier readily, as a general thing. He is too much of an individualist. Those of us who have reached middle age are not flexible enough as a rule to become either good drillmasters or well-drilled soldiers. As a class, the doctors at Greenleaf did not look the part, tending rather to slouchiness of carriage and of dress. The greatest blow that my pride in the title of Doctor has ever received, and one from which I have not yet recovered, fell one morning at battalion drill. Our company had been doing the evolutions in more than usually clumsy and ragged manner, when our battalion commander chanced to glance our way. He came over to talk to us, and he certainly had something to say. After watching our alleged drill for a few moments, he sneered at us, "Doctors, in uniform." That was all, but it expressed a bookful. We had thought that we were soldiers; that at least we were becoming such; but alas! all that we might ever hope to be did not reach beyond being doctors wearing the uniform. To such a point was this idea burned into my mind, and to such an extent was the title of *Doctor* a mark of opprobrium in camp, that I cannot help a slight shudder at being so addressed today, though I expect to get over it in time.

It does not seem to me that the same condition would be true of the doctors as a whole around here, but the physicians in camp were very childish. As the Camp Surgeon often expressed it, "Doctors are perfect babies and have to be treated as such." It was evidenced

in such ways as this. Men came to sick call for the slightest ailments; and if these were not treated with the greatest consideration and sympathy, they went and complained to the commander of the camp. Doctors, who more than other men should have known the discomforts of night calls, would drag the man covering this duty out of his bed for something from which they had been suffering all day, or for which treatment in the morning would have done just as well; and they invariably demanded to be sent to hospital for minor ailments. Fortunately I had little to do with Sick Call, or I should have been in trouble in short order. In one respect, the Sick Call was very simple. The doctor would just walk in, give us the exact diagnosis of his case, tell us how it should be treated, and if all of his recommendations were followed, he departed perfectly satisfied that he at least had had good medical attention. But if any man received a call down, he sulked and felt a personal grudge, and as a rule protested to higher authority.

One amusing instance was of a man who had just come to camp, bringing with him a large black cotton umbrella. The men in his barracks determined to have some fun with him, so they told him that black umbrellas were not regulation. Let me explain that soldiers do not carry umbrellas at all. However, this earnest soul was prevailed upon by schemers to go over to the Quartermaster depot, three miles away, to attempt to trade his black gamp for one of the regulation khaki shade. As a result of his attempt to provide himself with this useful article, a general order was issued next morning forbidding any hazing of newcomers, so I judge the victim took his troubles to Headquarters. While this was rather mild as hazing, and certainly had a large element of real wit in it as a joke, it was the only instance of hazing of any kind that I knew of. As a rule, the newcomer was given every possible help toward finding himself.

Some of the men practising medicine in some of the southern towns were unbelievably poorly trained. One man whom I assisted in examining for admission to the Army, was asked how he would make a diagnosis between a typical lobar pneumonia and a typical pleurisy with effusion. After considerable thought, he said that he was afraid that he could not answer that question, as he had never treated a case of either condition nor a case of typhoid. Asked what he would do to treat a burn of the third degree, since he said that he was a foundry physician and that most of his practice consisted in the treatment of burns, he stated that he would use antiphlogistine. Failing this medicament, no alternative suggested itself to his mind, nor could he think of any additional treatment. He admitted that he did not use and did not possess a stethoscope, a microscope, or a blood pressure outfit, and

that he never examined the urine. Another candidate who claimed to specialize in internal medicine, told me that the only intestinal parasites that he knew were typhoid and paratyphoid.

Chickamauga Park has climate and lots of it. For a year-around military camp in the United States, it probably could not be bettered, but that does not detract from the climate. In January, 1918, it went down to minus two of the thermometer, I have been told. I can testify to two above zero in January, 1919, and also to 114 in the shade in July, 1918. When it rained, it rained; and when lightning fell, there was no question as to what was going on, furnishing a pleasing introduction to the imminence of sudden death in France. But, O Boy! the mud. They tell me that there is mud in Texas, and there very well may be—I am not a quarrelsome person and I will believe anything once—but if Texas mud has anything on Oglethorpe when the frost is coming out of the ground, then I'm from Missouri. The water supply of the camp interested me. The water comes from the Tennessee river, and is chlorinated after filtration. You get used to it after a while, but for one who drinks spring water because he dislikes the taste of the Cochituate article, strong chlorine infusion is some brew. And sometimes in the shower baths there would be a sufficient escape of gas from the water to make one sneeze.

Some wonderful things came to us in the draft. An amazing bunch from Oklahoma came our way: cowboys, oil men, and Indians, chiefly Cherokees. It seemed a pity to put a crowd of natural scrappers like that into the Army as non-combatants in the Medical Department. One boy came to me for examination, with a peculiar, raw, snake-like track on his neck. I asked him about it, but he was shy and would not tell me what the mark was. Then I guessed. "Somebody put a rope on you?" I asked him. "Yes," he said, "the boys were playing some last night and roped me." The Oklahoma outfit gave a Wild West show that Saturday night that was the real thing. We had some Mennonites in the lot, and two Israelites, a small sect of Christians with smooth-shaven faces, hair down to their shoulders, and wearing long black robes. By careful manipulation of the line of inductants, I got me an Israelite for cardio-vascular examination, and obtained an unholy joy from putting this naked and scandalously sacrilegious-appearing youth through the "hopping test," hopping gravely by his side myself to the wonder of all beholders. Of course these were conscientious objectors, and being useless for any military purpose, they naturally were put into the Medical Department.

The professional instruction at Greenleaf was really wonderful. Probably there is no post-graduate school in the world that has ever

touched the Army school at Greenleaf, over the range of subjects covered there. Those men who needed a general review of the subject went to General Schools of Medicine and Surgery. There was an excellent course in operative surgery on the cadaver, conducted at Chattanooga. There was a wonderful course on heart and lungs. A thoroughly up-to-date equipment, with all the newest methods of localization, and some of the greatest teachers in the country, made the course in X-ray unapproachable anywhere. For the School of Sanitation, full-sized workable models of all the different types of apparatus had been constructed. There were fine schools for teaching eye, ear, nose, and throat, and a very elaborate course of instruction in orthopedics. The schools of surgery, orthopedics, and X-ray were supplemented by courses given in New York, Boston, and Philadelphia. There was also a School of Neuropsychiatry. To all of the men whom I knew or with whom I talked, who had had the opportunity to attend the special schools of medicine at Greenleaf, the advantages of having had this special training in their own line seemed to be great. Personally I am very certain that no man who went to the Medical Officers' Training Camp at Greenleaf, whether he knew much or little when he came to camp, left camp without being vastly benefited physically and professionally; and the experience is one that no man can ever regret, even if he missed the great opportunity of serving his country overseas.



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Original articles, items of news and matter of interest to the Services are welcomed. Requests for reprints should be made at the time of forwarding articles.

EDITOR,

COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

APPRECIATION

When Col. T. H. J. Goodwin, of the Royal Army Medical Corps, was recalled from his duties in Washington as Liaison Officer with our Medical Corps he left behind him many friends in the United States who had been charmed by his personality and impressed by his very clean-cut efficiency in all that pertained to the duties of his office. The recognition of his efficiency by his own country and his merited subsequent honors are a source of gratification to those who were fortunate in knowing him during his tour of duty with us, and the following letter, which we publish by permission of the Surgeon General of the Army, will have a very natural interest for them:

WAR OFFICE,
Whitehall, S. W. 1.
7th January, 1921.

My dear General Ireland:

The numerous kind and cordial messages and greetings which I have received during Christmas time from Officers—may I be presumptuous and say ‘brother Officers’—in the United States Military Medical Service, impel me to write and tell you how deeply I appreciate and value the very cordial relationship and affection which exists—and I hope will do so for all time—between your and my Medical Services.

The War brought us very closely together and I feel that the cordial relationships which existed between the heads of our Services, both here at the War Office and in France, also maintained throughout all ranks.

Our aims, ideals and pride in our respective Services are identical and I do most sincerely hope and believe that the close friendship and mutual support which existed so happily throughout the War may always be maintained.

We can never forget how generously your Service supported us in 1917, and how much that support and help meant.

Speaking from a personal point of view, I look back on my association with the Army Medical Service in Washington, and elsewhere in the United States, with the happiest possible recollections for I was fortunate enough to make many valued friends whom I can never forget.

General Gorgas's death was a terrible loss to the scientific world and also a great grief to me personally. He was a man whom I admired, respected and loved more than I can say, and it is a source of pride and happy memory to me that I was fortunate enough to possess his friendship.

I should be so grateful if you could convey to your officers my very kindest remembrances and my sincere good wishes for all possible success and prosperity for them and their Service now and in the future.

Believe me

Always yours very sincerely,

T. H. J. GOODWIN.

Maj. Gen. M. W. IRELAND, C.B.,
War Department, Office of the Surgeon General,
Washington, D. C.

In addition to the letter, Lieut. Gen. Sir John Goodwin, K.C.B., M.G., D.S.O., Director General, Army Medical Services, British Army, as he now is, forwarded a reprint describing a rather unusual dinner: one which must be a source of gratification to us of the medical profession. The title of this reprint is, "Report of Speeches at a Dinner in Appreciation of the Splendid Services of the Royal Army Medical Corps and the Eminent Civilians Attached to it During the War." This dinner was given on June 20, 1920, in London, and there were many notable persons present and messages from other distinguished men who were unable to attend.

The Earl of Middleton, who was Chairman, stated in his opening address that "messages of congratulation and regret for unavoidable absence had been received from: His Royal Highness The Duke of Connaught, Lord Derby, Lord French, Lord Byng of Vimy, Lord Islington, Lord Lee of Fareham, Field-Marshal Sir William Robertson, and many others." A notable list of those who had every opportunity to judge the worth of the Corps which was honored.

In addition to the opening speech by The Earl of Middleton, the Chairman, there were addresses by The Rt. Hon. Winston Churchill, Field-Marshal The Earl Haig, Lieut. Gen. Sir Alfred Keogh, Lieut. Gen. Sir John Goodwin and Maj. Gen. Sir George Makins.

The Earl of Middleton was earnest in his praise of the good work done, not only by the Royal Army Medical Corps, but by the medical

profession in general, and this sentiment was reflected in what was said by the other speakers who were not members of the profession.

There is one passage in the address of Sir John Goodwin which we believe should be reproduced here as an evidence of the appreciation felt for what we, on this side of the ocean, did for our British Allies. It is as follows:

"I should like to say one word on a subject with which I was rather closely connected, and that is the amount which America did for the Medical Service, and also for the Army in this war. I was sent out to America on a mission just after that nation came into the War. We were then in serious straits as regards shortage of medical and nursing personnel. I at once placed the whole situation frankly before the War Secretary, Mr. Baker, and before the head of the American Medical Service, General Gorgas. I cannot express to you the cordial way in which I was received, the sympathetic hearing which was accorded to me, and the generous response with which I met. General Gorgas, Mr. Baker, the American Army Medical Service, and not only they, but the whole Medical Profession of America, placed everything at my disposal, with the result that within a very few months over 1,000 American doctors and more than 700 nurses, equipped and uniformed by the American Army, were placed unreservedly, and without question, entirely at the disposal of the British Armies. Had it not been for the whole-hearted help afforded to us by America I hardly like to think what might have happened in 1918, owing to shortage of medical and nursing personnel in our Armies."

What a very graceful, satisfactory, comfortable thing it was to have conceived and carried to so brilliant a conclusion a testimonial as sincere and merited as was this complimentary dinner! It must be grateful to all of us who sometimes feel, wrongly, perhaps, that there may be an application in the line from Kipling's "Envoi" to "The Story of the Gadsbys," "His be the labor, yours be the spoil." It is good to be a good doctor: good to know that you have looked your obligations square in the face and not shifted: good to know that you have sacrificed and contributed for the cause and that some of you bear on your bodies, as proof, the scars of hostile steel: that some of you have given all that man can for a friend. But finally, how very good a thing of this sort is, the evidence that those with whom you have proved your loyalty concede to you that there is honor for those who strive with the scalpel as well as those who fight with the sword.

JAMES ROBB CHURCH.

ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, February 1, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Army

Lieutenant Colonel

Henry R. Carstens

Major

Frederick Isaiah Yates

Captain

Charles C. Gans

First Lieutenants

Lawrence Jesse Jones

Edward Stanley McCann

Medical Reserve Corps, U. S. Army

Lieutenant Colonel

James S. Hammers

Majors

Varney B. Hamlin

Samuel J. Hillis

Harry George Macdonald

Richard Gordon Simmons

William J. Tindall

Harold F. Wagner

Alford E. W. Yale

Captains

George Allen Dicus

Elmer Alfred Gunderson

W. Atlee Hickman

Milton U. McIntyre

William Linus Stephenson

Daniel Witwer Weaver

First Lieutenants

Roy William Allen

Clarence E. Broderick

H. W. Froehlich,

Lloyd C. Harvie

Orion Chester Jones

United States Public Health Service

Surgeon

George Sawyer Pitcher

Passed Assistant Surgeon

Lester Irving Ofner

Assistant Surgeons

Ewald Emil Hermann

Willis Ivan Lewis

Benjamin Franklin Ward

Acting Assistant Surgeon

T. G. Allen

Medical Corps, United States Naval Reserve Force

Senior Lieutenant

John Edward Dutcher

Lieutenant

Frank Theodore Maxson:

Medical Corps, New York National Guard

Major

William Schroeder, Jr.

Associate Member

Lieut. Col. Robt. H. Mills, D. C., U. S. A.

IN REGARD TO THE ANNUAL MEETING

The Annual Meeting will be held in Boston, Mass., from Thursday, June 2, to Saturday, June 4, inclusive, and the headquarters and meeting place will be announced in the next issue of THE MILITARY SURGEON.

The Executive Council in making this decision in regard to the Annual Meeting followed last year's precedent in setting the time immediately prior to the meeting of the American Medical Association in order that it might be possible for members to attend both meetings without the expense incident to two separate journeys.

It is expected that the program will be in the nature of that at New Orleans last April, and as soon as completed this will be announced in the pages of the journal. Invitations will be sent to a number of the allied Governments and it is hoped that a number of delegates from these will be in attendance.

Those who were in attendance at the meeting at New Orleans last year will remember the meeting as a satisfactory one and of much interest to those who were present and it is hoped that the attendance at this will be even in excess of that gathering. As our meeting closes on Saturday and that of the A. M. A. does not begin until Monday, there should be no difficulty in securing accommodations for attendance at the convention of the Association of Military Surgeons. Those who expect to stay on through the meeting of the A. M. A. would be wise in making their hotel reservations well in advance on account of the number who will doubtless be present at that time. Subjoined, extracted from the journal of the A. M. A., is a list of the hotels selected as subsidiary headquarters by the A. M. A. which may serve as a guide to those who wish to make reservations for hotel accommodations.

AMERICAN MEDICAL ASSOCIATION

THE BOSTON SESSION

Hotel Headquarters

<i>Sections</i>	<i>Headquarters</i>
Practice of Medicine.....	Hotel Somerset
Surgery, General and Abdominal.....	Hotel Lenox
Obstetrics, Gynecology and Abdominal Surgery.....	Hotel Touraine
Ophthalmology.....	Hotel Vendome
Laryngology, Otology and Rhinology.....	Hotel Brunswick
Diseases of Children.....	Parker House
Pharmacology and Therapeutics.....	Copley Square Hotel
Pathology and Physiology.....	Hotel Bellevue
Stomatology.....	Parker House
Nervous and Mental Diseases.....	Young's Hotel
Dermatology and Syphilology.....	Copley Square Hotel
Preventive Medicine and Public Health.....	Hotel Bellevue
Urology.....	Hotel Westminster
Orthopedic Surgery.....	Adams House
Gastroenterology and Proctology.....	Hotel Essex

COMMENT AND CRITICISM

SEWAGE DISPOSAL IN THE COUNTRY

A system by which an isolated dwelling (or small group of buildings) having running water may dispose of sewage safely and at small cost is recommended by the U. S. Public Health Service in one of its recent weekly reports.

The chief feature of the system, which has been in successful operation in New Hampshire for summer cottage and hotels for ten years, is a rectangular septic tank, of concrete, with a minimum capacity of 94 feet. This will serve 20 people; four cubic feet additional should be provided for each additional person.

The tank should be buried under 12 to 18 inches of earth, as near as practicable to the house, with which it should be connected with piping. The effluent from this tank which contains organic matter that might be objectionable and even dangerous, is commonly best disposed of by some sort of subsurface irrigation whose exact form will necessarily be governed by the nature of the soil. Full details are given in the report.

Before installing such a system, however, the State health authorities should be consulted, especially in the limestone sections of the country, where care is necessary to prevent the contamination of springs and other underground waters.

STATISTICAL RÉSUMÉ OF X-RAY WORK IN ARMY HOSPITALS IN THE UNITED STATES AND INSULAR POSSESSIONS

(February, 1918, to June, 1919, inclusive)

Average number of patients <i>served</i> per roentgenologist per month.....	364
Average number of patients <i>examined</i> per roentgenologist per month.....	227
Percentage of patients <i>admitted</i> to army hospitals examined by x-ray.....	54.1

Anatomical percentages:

Accessory sinuses.....	1.8
Bones and Joints.....	17.0
Pulmonary.....	13.6
Cardio vascular.....	1.3
Foreign Bodies.....	1.9
Gastro intestinal.....	2.0
Head.....	1.6
Pelvis.....	0.8
Spine.....	1.5

Teeth.....	10.0
Urinary tract.....	9.0
Miscellaneous.....	1.3

Percentage of patients examined by x-ray that were fluoroscoped..... 15

GRAND ANATOMICAL CLASSIFICATION OF CASES EXAMINED, FEBRUARY TO JUNE, INCLUSIVE, X-RAY SECTION, DIVISION OF SURGERY, MEDICAL DEPARTMENT UNITED STATES ARMY

Fluoroscopies.....	24,501
Films—X-ray.....	62,252
Films—dental.....	60,653
Plates.....	164,061
Accessory sinuses.....	4,788
Bones and joints.....	43,245
Pulmonary.....	35,414
Cardiovascular.....	3,594
Foreign bodies.....	4,877
Gastro-intestinal.....	5,283
Head.....	4,175
Pelvis.....	2,072
Spine.....	3,980
Teeth.....	36,950
Urinary tract.....	3,538
Miscellaneous.....	3,302
Total Examinations.....	161,612
Number of patients examined.....	140,205
Total admissions to hospitals.....	258,881
Daily average number of patients.....	44,354
Number of commissioned officers.....	142 (711)
Number of enlisted men.....	246 (1,232)
Average number of patients per roentgenologist.....	227.5

MEMORANDUM ON STATISTICS OF LOSSES IN THE BELGIAN ARMY DURING THE EUROPEAN WAR

The following data have been furnished by Regimental Surgeon Voncken, editor of the *Archives Medicales Belges*. Dr. Voncken states that these figures are by no means final or definitive since the work of collating the military statistics from the recent war is still in progress and by no means complete. It is thought, however, that the following provisional figures may be of interest to the readers of THE MILITARY SURGEON.

Total losses of the Belgian Army from 1914 up to November 11, 1918: 2,714 officers and 102,065 men.

Statistics of losses up to December 15, 1918:

Number of men treated in hospital, 200,409, of whom 122,987 were sick and 77,422 were wounded.

Number of deaths: 9,422, of which 4,508 resulted from disease and 4,914 from wounds.

Number of amputations: 1,387

Number of blinded soldiers: 66

Number of recoveries: 160,052.

The Bureau possesses almost no information in regard to the wounded of 1914 who remained in that part of Belgium occupied by the Germans or were taken as

prisoners to Germany; on the other hand, many cases of hospitalization of our troops in France at the beginning of the war have not yet been reported to us.

REPORT OF SURGEON GENERAL CUMMING (PUBLIC HEALTH)

In the annual report of the Public Health Service, which was submitted to Congress recently by the Secretary of the Treasury, Surgeon General Cumming discusses, among many other subjects, the matter of appropriations for new hospitals for War Risk Insurance Patients; immigration and quarantine, situations here and abroad and the loss of personnel to the Service. He says, in part:

IMMIGRATION AND DISEASE

With the cessation of hostilities in Europe and the resumption of maritime commerce the danger of the introduction of epidemic diseases into the United States increased. During the war, sanitation and public hygiene were more or less neglected. In the countries of Central Europe conditions became very favorable for the outbreak of epidemic diseases, and, in many areas, infection of typhus, plague, and cholera smouldered along ready to burst forth under conditions that subsequently were sure to arise. The saving feature of the whole situation was the restriction of travel from one country to another. On the resumption of commercial intercourse the expected happened. Even before the armistice this condition of affairs was foreseen and medical officers of the Public Health Service were sent to Europe for the purpose of investigation and to make preparation for the application of preventive measures at European ports of departure whenever there should be resumed trans-Atlantic travel. At present officers of the Public Health Service are stationed at practically all of the important ports of continental Europe for the purpose of inspecting vessels and personnel prior to their departure for ports of the United States. All verminous persons coming from typhus-infected areas are required to undergo appropriate treatment and detention when necessary before embarkation. Notwithstanding this precaution, however, typhus has broken out on several of the vessels bound for ports of the United States, but, with the detection of the disease on the arrival of the vessel and the appropriate treatment of personnel at quarantine stations, the efforts to prevent the introduction of typhus from Europe have proven entirely successful. Measures in force along the Texas-Mexican border to prevent the introduction of typhus from Mexico into the United States have been equally effective. While typhus would probably never cause such a serious epidemic in the United States as in other countries, it is by no means improbable that the conditions in the tenement sections of the larger cities would not be productive of a serious epidemic of typhus if the infection were introduced into such localities.

LEGAL STATUS OF SERVICE

It is believed to be of the utmost importance that the legal status of the Public Health Service in its war risk work should be firmly established by placing an administrative head over the three major agencies involved, namely, the War Risk Insurance Bureau, the Federal Board for Vocational Education, and the Public Health Service, and that these three bureaus should operate thereunder as coördinate and independent bureaus in close coöperation.

HOSPITAL APPROPRIATIONS

In October, 1919, the department submitted to Congress a program recommending an appropriation of \$85,000,000 for the construction and acquisition of additional facilities to meet the growing needs of the service in connection with the care and treatment of war-risk insurance beneficiaries. Congress in its wisdom, however, deemed it unadvisable to appropriate this money for hospital purposes. Since then, the number of beneficiaries has steadily increased, and recent reports indicate that about 20,000 patients were, on July 1, receiving hospital care from the Public Health Service, as against 2,000 when the request was made.

In addition to increasing existing facilities by the construction of new hospitals, it is desired to bring to the attention of Congress the dilapidated and unsatisfactory condition of many of the hospitals now owned and operated by the Public Health Service. Some of these hospitals have been owned by the Government for years and were used for the treatment of seamen of the merchant marine and other beneficiaries of the service prior to the act which admitted ex-service men of the recent war as beneficiaries. It is presumed that these institutions will be made use of for years to come for these beneficiaries, despite action which Congress might take with reference to the beneficiaries of the War Risk Insurance Bureau. It is, therefore, necessary that these institutions be placed in first-class condition. All of the marine hospitals at the present time, with but few exceptions, are of antiquated construction and badly in need of repair. But a few years will elapse before it will be necessary to discontinue entirely the use of these institutions, unless steps are taken to reconstruct and remodel the same to meet with modern ideas of hospital construction and management. Recommendations as to the hospital needs for patients of the Bureau of War Risk Insurance will be presented to Congress in a separate communication.

The Public Health Service reiterates its firm belief that an adequate hospital construction program should be undertaken by the National Government for the care of ex-service men and women. It is not clear how this responsibility can be adequately met in any other way. It is not believed necessary to go into a very extensive hospital construction program, but certain consideration should be given to a program sufficiently adequate to meet the needs of the situation, and this will mean the expenditure of many millions of dollars. It is repeated that the special needs to be met are those of ex-service men and women suffering from tuberculosis and mental disorders. These groups of patients will require treatment for long periods of time, and their demand is for care and treatment in governmental institutions.

LOSS IN PERSONNEL

Despite the temporary increase in compensation granted by the Congress during its last session, the Public Health Service, in common with the Medical Corps of the Army and Navy, finds it impossible to secure candidates for admission to the entrance grade of its regular corps, and the attractions offered its scientific personnel are such that the resignations have actually exceeded the admissions during the past 12 months.

BOOK REVIEWS

MEDICAL ELECTRICITY. A Practical Handbook for Students and Practitioners, by H. Lewis Jones, M.A., M.D., F.R.C.P., Late Consulting Medical Officer to the Electrical Department of Saint Bartholomew's Hospital. Eighth Edition. Revised and Edited by Lullum Wood Bathurst, M.D. (Lond.) Late Physician in Charge of Electrotherapeutic Department, Royal Free Hospital (Officers' Section); Late Chief Assistant, Electrical Department, Saint Bartholomew's Hospital. With Illustrations. Philadelphia: P. Blakiston's Son & Co., 1920. Price, \$6.

Since the 1917 edition of this valuable work appeared medical electricity has expanded in various directions and the new edition has brought the subject up to date. The new methods and applications of electricity evolved as the result of war-time exigencies are described and discussed. The chapter on Roentgen rays has been omitted as the editor considers that it is difficult, if not impossible, to treat it with adequacy within the compass of a book devoted to medical electricity in general. However, the effects of Roentgen rays are dealt with in discussing physiological and pathological conditions, and their value as an alternative in the treatment of various conditions is estimated. A new chapter on ultra-violet radiation has been added and a fair amount of new material relating to ionization, diathermy, and the electrical testing of muscles has been incorporated in the book.

FRANCIS M. MUNSON.

THE ANATOMY OF THE HUMAN SKELETON. By J. Ernest Frazer, F.R.G.S., Eng. Professor of Anatomy in the University of London and Lecturer in the Medical School of St. Mary's Hospital; Examiner in Anatomy for the University of London; Examiner in Anatomy for the Primary Fellowship of the Royal College of Surgeons of England; formerly Examiner in Anatomy for the Conjoint Board of The Royal Colleges of Physicians and Surgeons. Second Edition, with 219 illustrations. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street. 1920. Price \$10.

The demand for a second edition of this combined monograph and atlas is a tribute to its merits. In the new edition the author has retained his original plan of attempting to induce the student to think of the bones as they exist in the body rather than as they lie on the table before him, and to do this he has laid stress on the meaning of small details and on the relations of the bones, and has relegated the pure description of the dry bone to a secondary place. This plan, combined with the splendid illustrations, should make the study of osteology from this volume an interesting one. The whole text has been submitted to careful revision, and a few new illustrations added.

FRANCIS M. MUNSON.

PUBLIC HEALTH AND HYGIENE. In Contributions by Eminent Authorities. Edited by William Hallock Park, M.D., Professor of Bacteriology and Hygiene, University and Bellevue Hospital Medical College, and Director of the Bureau of Laboratories of the Department of Health, New York City. Illustrated with 123 illustrations. Philadelphia and New York: Lea & Febiger, 1920. Price, \$10.

This handsome volume is, in some respects, disappointing. It has not been as carefully edited as the reputation and ability of the editor would lead us to expect.

Everybody's business is nobody's business and the result is that some important points have been omitted from the work. Several of the distinguished authors have not done themselves justice in their contributions. The outstanding, redeeming feature of the book is the masterly presentation of the subjects of air and ventilation by C. E. A. Winslow. To those specially interested in the subject, this monograph is worth the price of the volume. The author of the chapter on tropical hygiene has apparently attempted to write epitomes of the subjects of general hygiene, tropical hygiene, meteorology, and medical zoology, and has succeeded with none of them. The illustrations are good and the free use of bold-faced type is an aid to ready reference.

FRANCIS M. MUNSON.

PRACTICAL PREVENTIVE MEDICINE. By Mark F. Boyd, M.D., M.S., C.P.H., Professor of Bacteriology and Preventive Medicine in the Medical Department of the University of Texas; Passed Assistant Surgeon (Reserve) U. S. Public Health Service; Formerly Epidemiologist of the Iowa State Board of Health and Associate Professor of Preventive Medicine in the College of Medicine of the University of Iowa; Charles Follen Folsom Teaching Fellow in Hygiene, Harvard Medical School. 135 illustrations. Philadelphia & London: W. B. Saunders Co., 1920. Price \$4.00.

The author has endeavored in this volume to condense the entire subject of preventive medicine and he has succeeded in covering a great deal of ground. He does not overstate the matter when he says in the foreword that the contents of the book represent the minimum knowledge of the subject which a student of medicine or a practitioner of medicine should be expected to possess. Some of the chapters are so brief that their practical value is questionable. The references are numerous and will serve as guides to further studies of the subject. The illustrations are numerous and excellent; they form, to the mind of the reviewer, the most valuable feature of the book.

FRANCIS M. MUNSON.

THE SYSTEMATIC TREATMENT OF GONORRHOEA IN THE MALE. By Norman Lumb, O. B. E., Author of "The Urethroscope in the Diagnosis and Treatment of Urethritis." Late R.A.N.C. Specialist in Charge of Venereal Diseases, and Officer-in-Charge of Division, 39 and 51 General Hospitals, B.E.F., Clinical Assistant, St. Peter's Hospital for Stone. Second Edition. Philadelphia and New York: Lea and Febiger. Price \$1.75.

This is a small volume which contains a description of the methods that have been found to be most successful in the treatment of gonorrhoea and its complications. The most recent developments in examination and treatment are included in the second edition, especially the use of vaccines in the acute stage of gonorrhoea and the treatment of the disease with detoxicated vaccines. The book will be found valuable in the clinics now being established as a feature of the campaign against venereal disease.

FRANCIS M. MUNSON

A PRACTICABLE ROOT-CANAL TECHNIC, by Arthur Barton Crane, D.D.S., Washington D. C. Illustrated with 48 engravings. Philadelphia and New York: Lea & Febiger, 1920.

In this excellently written little volume Doctor Crane has presented in a concise and orderly manner a complete root-canal technic which is giving a large percentage

of successful results in his extensive practice. It is a digest of the various methods advocated by the leading dental technicians, modified and supplemented by study and original research.

The subject is treated in the following manner: Diagnosis, Asepsis, Instrumentation of the Canal, Therapy, Bacteriology, Obliteration of the Canal, and Surgery.

The illustrations are of an unusually high order, many of them being from X-ray photographs; the type is large and clear, the paper of substantial quality and the book is attractively bound.

FRANCIS M. MUNSON.

A STUDY IN THE EPIDEMIOLOGY OF TUBERCULOSIS, WITH SPECIAL REFERENCE TO TUBERCULOSIS OF THE TROPICS AND OF THE NEGRO RACE, by George E. Bushnell, Ph.D., M.D., Colonel (retired), M.C., U.S.A. New York: William Wood and Company, 1920. Pp. 221.

The name of Colonel Bushnell, the author of this book, will be familiar to all medical men who served in the tuberculosis department of the Army during the late war. Under Colonel Bushnell's guidance and organization the almost incredible task of examining every recruit before going overseas was accomplished, and as a result, there was only 2.3 per cent deaths in the expeditionary forces from tuberculosis. Colonel Bushnell's long experience in dealing with tuberculosis as head of the Army Sanatorium at Fort Bayard, New Mexico, and his profound study of the subject especially of the literature of the disease as it has been observed in the Tropics, renders this work one of especial importance; indeed, Colonel Bushnell may be called the "philosopher of tuberculosis." In this comparatively small book there has been compressed a vast amount of information, never before thus brought together, regarding the incidence of tuberculosis among uncivilized, isolated people, who have never been brought in contact with the tubercle bacillus. After reviewing the pre-Kochian era in the history of tuberculosis, Colonel Bushnell discusses the various explanations given for the differences in the incidence of the disease in the Tropics, such as climate, racial predisposition, unsanitary conditions of living, alcoholic excesses, syphilis, etc., all of which he considers as unsatisfactory an explanation for susceptibility to tuberculous infection in the Tropics as it has proved in the Temperate Zone. He then proceeds to develop what he conceives to be the true explanation, and he brings to the support of his argument a vast amount of evidence drawn from widely different regions and from many observers. In brief, the real explanation is exposure to tuberculous infection, in tuberculization or nontuberculization. Where a community has, from its remoteness, had little or no contact with civilization and hence little or no exposure to tuberculous infection, tuberculosis is absent or comparatively rare. When it does occur, however, the mortality is "frightfully high," and the disease may become an epidemic. On the other hand where a community has long been more or less civilized and in consequence had long and abundant opportunity to become exposed to tuberculous infection, the disease is prevalent, but it is chronic and more or less curable, the difference in the two cases being that one community or race has been tuberculized and the other not. According to Romer's law, while Colonel Bushnell quotes, "where tuberculosis is a rare disease the cases that occur will be acute and fatal; where the disease is common the type will be chronic and relatively benign." Colonel Bushnell, therefore, divides pulmonary tuberculosis into two general classes: the first, the primary form, occurring in those who have had no previous immunizing infection, differing both in its progress and pathology from the second class, and the second, the fibro-caseous or chronic form, such as is so familiar to us. This latter form he believes is the result of the

failure of the immunizing infection, and not from a new or recent infection. Running all through the book is the repeated emphasis upon the supreme significance of immunity infection or tuberculization in determining the incidence and character of active tuberculosis.

When once tuberculized, as Colonel Bushnell believes the most of us are in civilized communities, he considers that a new exogenous infection is rare if it ever occurs, except when the primary or immunizing infection is inefficient. Moreover, this immunizing infection occurs sometime in childhood. In the present state of our civilization, then, we have great reason to thank the tubercle bacillus for its ubiquity so that we may readily obtain our protective immunity from later active disease through a new infection. Viewed in this light we may regard the tubercle bacillus as a sort of grim guardian angel.

"Much as the consumptive is dreaded at close quarters for the uninfected," says the Colonel, "he is indispensable in the present era, because he unwittingly provides for the immunization which prevents our race from perishing as so many other races have perished when thrust unprepared into the midst of infection." "Civilized man," continues the Colonel, "can never escape the danger of infection with the tubercle bacillus, and if he did, we should all lose the benefits of tuberculization. Optimal immunization until 100 per cent become immune is the wished-for goal."

With regard to the rôle of the bovine bacillus, Colonel Bushnell considers it distinctly subordinate to that of the human type in the infection of man; and the fact that it is relatively rare in a nation of milk drinkers he considers the best proof that an "immunity against the bovine type is regularly obtained through early infection with the human tubercle bacillus."

The history of tuberculosis among the North-American Indians, as the Colonel shows, is very similar to that of the non-immunized races in tropical regions; he considers them a race either imperfectly immunized or not at all. With the negroes, however, he believes that they were largely tuberculized while in slavery, and that their greater mortality over the white race, after they obtained their freedom, was due to their unhygienic mode of life and excesses rather than to a new or primary infection. Thus from these studies of Colonel Bushnell we may draw the general conclusion that the peoples of the world are divided into two classes as regards tuberculosis: the immunized who have received a protective infection, which class includes the inhabitants of all civilized countries; and the non-immunized or unprotected, consisting of the uncivilized or remote races, and infants and very young children in civilized communities.

That "practically all civilized adults, even the most healthy, have undergone a tuberculous infection," Colonel Bushnell believes to be a fact, and observations from autopsies of individuals dying from other disease, the von Pirquet test, and radiography upon the healthy subject go far to prove this. This fact, he says, is hardly of less importance in phthisiology than the discovery of the tubercle bacillus.

The belief formerly held in the "pre-Kochian" era, that tuberculosis was not infectious, contains an element of truth in that "it is not infectious for those who have received an immunity infection even though it be occult."

As a result of these studies in the epidemiology of tuberculosis, Colonel Bushnell makes several practical suggestions: First, that we should lay less stress upon the dangers of adult infection and more upon that of the non-immunized infant and recently immunized young child; second, that "we should improve in every possible way the health of the community so that a fortunate initial infection shall not be

impaired and be converted into manifest and dangerous disease"; third, that tuberculosis workers and associations might well undertake the task in their respective communities of testing the children by the tuberculosis cutaneous test, such tests to be continued for a series of years. The collection of such a series of observation would be of extreme value, Colonel Bushnell believes, both for guidance in prophylaxis and treatment as well as for statistical information.

His large personal experience in dealing with tuberculosis and his deep and long study of the subject give great might to Colonel Bushnell's conclusions, carefully deduced from the mass of evidence he presents, but not even he would probably be willing to admit that the evidence at hand was quite adequate to definitely prove, without a doubt, all his contentions, although it must be confessed that in the present state of our knowledge they best explain the facts gathered from many parts of the world relating to the various forms and manifestations of tuberculosis. "Should we not look forward," Colonel Bushnell concludes, "to the time when nature's method of tuberculization so terribly wasteful of human life shall be replaced by a thoroughly scientific method of artificial inoculation in which no life will need to be sacrificed?" For this supreme consummation laboratory workers are striving and all humanity is expectantly waiting.

EDWARD O. OTIS.

PULMONARY TUBERCULOSIS, a handbook for students and practitioners, by E. O. Otis, A.B., M.D., Professor of Pulmonary Diseases and Climatology, Tufts Medical School. Second edition, Boston: W. M. Leonard, 1920. Price, \$3.50.

An experienced internist and for many years a teacher of medical students, Dr. Otis has devoted especial attention to tuberculosis and has long been recognized as one of the foremost authorities in that field. No one is better qualified than he to write upon this subject. In the first edition of this work published in 1917 it is designated by the author "a handbook for students." But the book having been much appreciated by many other readers and a new edition being now called for, Dr. Otis has taken advantage of the opportunity to enlarge its scope by the addition of a considerable amount of new material and now calls it "a handbook for students, practitioners and patients." A work intended for so wide a circle of readers would naturally not venture far on debatable ground. As Dr. Otis expressly states, it is intended for a handbook, not a treatise upon tuberculosis. It is to be commended as a readable but concise exposition of the generally accepted views on tuberculosis, set forth clearly and simply so that it may be comprehended by any intelligent reader. Its value is enhanced by numerous case histories, as concrete illustrations of the principles that the author seeks to enforce.

G. E. BUSHNELL.

THE SHIBBOLETHS OF TUBERCULOSIS, by Marcus Paterson, M.D., Medical Superintendent, Metropolitan Asylums Board, Colindale Hospital. New York: E. P. Dutton & Co., 1920. Price, \$5.00.

The author was formerly the Medical Superintendent of the Brompton Hospital Sanatorium at Frimley and is well known as the chief exponent of the theory of auto-inoculation in pulmonary tuberculosis by means of carefully regulated exercise. The pronunciation of the Hebrew word "shibboleth" was originally used as a test to distinguish friends from enemies belonging to another tribe who could not pronounce the word, just as, for example, a German could be detected today by his inability to pronounce "th" properly. Dr. Paterson cites from the *Encyclopedia Britannica* a definition of the word with a secondary meaning: "A catch phrase or cry to which the members of a party adhere after any significance or meaning which it may have

imparted has disappeared," and under the heading of "shibboleths" discusses a variety of topics connected in some way with tuberculosis. In some of the chapters popular inaccuracies or errors are challenged, but a very considerable number of the "shibboleths" criticised are opinions adverse to his theory of auto-inoculation. The book, therefore, barring some digressions, may be said to amount to a defense of his theory, a defense which seems to the reviewer not altogether convincing.

G. E. BUSHNELL.

THE DIAGNOSIS AND TREATMENT OF BRAIN INJURIES, by William Sharpe. Publishers: J. B. Lippincott and Company.

This book of 750 pages is devoted to the diagnosis and treatment of brain injuries and the advances in this branch of surgery in recent years. It is based upon a very large experience and a study of the results in the large hospitals throughout the country.

The author states that the attitude of helplessness in the treatment of this class of cases has allowed the patients to be almost, if not quite, neglected. The attitude is often expressed: "If the patient recovers, remarkable, he had a fracture of the skull; if he dies, well, he had a fracture of the skull." To substantiate this he gives the mortality for these cases in the large New York hospitals of from 48 per cent to 68 per cent; Cook County Hospital, Chicago, 53 per cent; Roosevelt Hospital, 57 per cent.

The author emphasizes the fact that it is not the presence or absence of fracture of the skull that is the real factor of importance as a guide to treatment, but the presence or absence of brain injury. The most serious and urgent condition to demand prompt relief is intracranial pressure. In all patients with intracranial pressure symptoms, with or without fracture of the skull, immediate operation should be advised, not only to save life but to prevent or lessen the distressing post-traumatic conditions.

Two periods are given in which an operation is distinctly contraindicated: first, the condition of severe shock in the beginning, and second, the condition of medullary oedema and collapse. Too frequently have patients been operated upon in the condition of shock, thus throwing away any chance they may have had. In the stage of medullary oedema it is useless to operate, as the patient will die, operation or no operation.

By following the treatment, indications and contraindications, as given in detail in this exhaustive book, the writer has been able to lower the mortality from the average of 50 per cent now obtained in most hospitals to 28.4 per cent at the New York Polyclinic Hospital.

The book is divided into three parts: part one covers general considerations, pathology diagnosis and treatment, including operative technique; part two, brain injuries, acute and chronic, in adults; part three, brain injuries, acute and chronic, in newborn infants and children. Parts two and three, comprising nearly two-thirds of the book, is devoted to case reports, arranged into groups covering the different classes of injuries according to pathology and treatment. The treatment followed in each case is given in detail, and the reasons for using the method, also the complete autopsy findings in the fatal cases and the author's conclusions.

There are many excellent original illustrations and the subject is interestingly and clearly written. It is a valuable contribution to cranial surgery and a useful guide and reference book. It should aid in stimulating a renewed interest in these severe injuries and lead to a bettering of the present mortality rate.

WALTER D. WEBB.

THE SURGICAL CLINICS OF CHICAGO, Volume 4, Numbers 5 and 6 (October and December, 1920). Philadelphia and London: W. B. Saunders Company. Published bi-monthly. Price per year, Paper, \$12.00; cloth, \$16.00.

These two, the final numbers of the *Surgical Clinics of Chicago*, are probably two of the best ever published, and still further enhance the value and reputation of the periodical. It can hardly be denied that, of late years particularly, Chicago has forged to the front as our leading center for the teaching of Clinical Surgery, and the *Surgical Clinics of Chicago* have aided in no small way in this direction. Most of the contributors to this publication are men of wide experience and national reputation, and several have a way of telling what they know in such an interesting, understandable fashion, that their teaching sinks in so that it can be carried-on. It is a misfortune for many of us that we should in the future learn from them only occasionally. With the December, 1920, number the *Surgical Clinics of Chicago* cease to exist, and in their place will appear the *Surgical Clinics of North America*, a nomadic kind of publication intended to represent the teachings of other surgical centers as well as that of Chicago. It is to be copied after a similar periodical, the *Medical Clinics of North America*, and future numbers will record the work of Philadelphia surgeons, New York surgeons, Boston surgeons, and those of enough other cities, we presume, to make the wheels go round. Unquestionably there are in each large surgical center men of great eminence and ability about whose work we should all know more. A criticism of the new plan, however, is that we will see these new men in action—so to speak—only once a year, or perhaps at a longer interval, whereas, in the *Surgical Clinics of Chicago* many of the most prominent teachers contributed in each number, and we readers were better able to standardize the men and appreciate the worth-while of their contributions. In parting with the *Surgical Clinics of Chicago*, an admirer cannot help remembering the admonition of the old Scotch song,

It's gude to be merry and wise, it's gude to be honest and true,

And afore you're off wi' the auld love it's best to be on wi' the new.

Those of us who have been in the harness for many years must recognize that there is a progressiveness in all affairs, and the move from Chicago is probably one of wisdom. The Philadelphia number, published in February, will be read with great interest and no doubt the Clinics will live up to the high standard of that great surgical center. The new publication will create a healthy rivalry between all surgical centers which will redound to the benefit of the medical profession in general.

DR. JOHN E. SUMMERS.

THE DIFFICULTIES AND EMERGENCIES OF OBSTETRIC PRACTICE, by Comyns Berkeley, M.A., M.D., M.C., Contab., F.R.C.P. (Lond.), M.R.C.S. (Eng.). Obstetric and Gynecological Surgeon to the Middlesex Hospital, etc., and Victor Bonney, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.), M.R.C.P. (Lond.), Assistant Obstetric and Gynecological Surgeon to the Middlesex Hospital, etc. Third Edition. 309 Illustrations. Philadelphia: P. Blakiston's Son & Company. 1020 Walnut Street. 1921. Price, \$11.00.

In the new edition of this excellent work the authors have adhered to their original plan of deliberately omitting the physiology and the management of normal pregnancy, labor, and puerpery. It is intended to be, and is, a guide in plain terms to the practitioner when he is called upon to deal with the difficulties that attend obstetric practice. The book has been thoroughly revised and much new matter has been added, notably a chapter on the feeding of infants.

FRANCIS M. MUNSON.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

- SURGERY.** A Text Book by Various Authors. Edited by George E. Gask, C.M.G., D.S.O., F.R.C.S. (Eng.), and Harold W. Wilson, M.S., M.B. (Lond.), F.R.C.S. (Eng.) With 39 plates, 20 in color, and 467 black-and-white illustrations. Philadelphia, Pa.: P. Blakiston's Son and Co., 1920.
- THE SURGICAL CLINICS OF CHICAGO,** October, 1920. Bi-monthly. Philadelphia and London: W. B. Saunders Company. Price per year, \$12.00.
- SURGERY: ITS PRINCIPLES AND PRACTICE.** By Astley Paston Cooper Ashhurst, A.B., M.D., F.A.C.S. Second Edition, thoroughly revised. With 14 colored plates and 1,129 illustrations in the text, mostly original. Philadelphia and New York: Lea & Febiger, 1920. Price \$10.00.
- 1919 COLLECTED PAPERS OF THE MAYO CLINIC, ROCHESTER, MINN.** Octavo of 1,331 pages, 490 illustrations. Philadelphia and London: W. B. Saunders Company. Cloth, \$12.00 net.
- SURGICAL PATHOLOGY AND MORBID ANATOMY.** By Sir Anthony A. Bowlby, K.C.B., K.C.M.G., K.C.V.O., F.R.C.S., and Sir Frederick W. Andrewes, M.D., F.R.S. Seventh Edition, with 210 illustrations. Philadelphia: P. Blakiston's Son & Co., 1920. Price, \$8.00.
- ANAESTHETICS.** Their Uses and Administration. By Dudley Wilmot Buxton, M.D., B.S. Sixth Edition. Philadelphia: P. Blakiston's Son and Co., 1920. Price, \$6.00 net.
- PUBLIC HEALTH CHEMICAL ANALYSIS.** By Robert C. Frederick and Aquila Forster. London: Constable & Company, Ltd., 1920.
- THE DIFFICULTIES AND EMERGENCIES OF OBSTETRIC PRACTICE.** By Comyns Berkeley, M.A., M.D., M.C., Cantab. F.R.C.P., Lond. M.R.C.S., Eng. and Victor Bonney, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.), M.R.C.P. (Lond.). Third Edition, with 309 illustrations. Philadelphia: P. Blakiston's Son & Co., 1921. Price, \$11.00.
- ESSENTIALS OF TROPICAL MEDICINE.** By Walter E. Masters, M.D. Brux., M.R.C.S., L.R.C.P. (Lond.). New York: William Wood & Company, 1920. Price, \$11.00.
- THE BASIS OF PSYCHIATRY.** By Albert C. Buckley, M.D. With 79 illustrations. Philadelphia and London: J. B. Lippincott Company. Price, \$7.00.
- THE SURGICAL CLINICS OF CHICAGO.** Volume iv, Number 6. December, 1920. Octavo of 1,336 pages, 57 illustrations and complete index to Vol. iv. Philadelphia and London: W. B. Saunders Company, 1920. Published bi-monthly; price per year: paper, \$12.00; cloth, \$16.00 net.
- THE PRACTICAL MEDICINE SERIES.** Volume ii, General Surgery, edited by Albert J. Ochsner, M.D., F.R.M.S., LL.D., F.A.C.S., Major M.R.C., U.S.A., Series 1920. The Year Book Publishers, 304 S. Dearborn Street, Chicago, Ill. Price of this volume \$2.50; price of the series of eight volumes, \$12.00.
- THE PRACTICAL MEDICINE SERIES.** Volume iv, Pediatrics, edited by Issac A. Abt, M.D.; with the collaboration of A. Levinson, M.D.; Orthopedic Surgery edited by Edwin W. Ryerson, M.D., with the collaboration of Robert O. Ritter,

M.D., Chicago, Ill., the Year Book Publishers, Series 1920. Price of this volume, \$1.75; price of the series of eight volumes, \$12.00.

DISEASES OF THE EAR. By Philip D. Kerrison, M.D., 332 Illustrations and 2 full pages in color. Second Edition, revised and enlarged. Philadelphia: J. B. Lippincott Company, 1920. Price, \$6.50.

A SYNOPSIS OF SURGERY. By Ernest W. Hey Groves, M.S., M.D., B. Sc. (Lond.), F.R.C.S. (Eng.). Fifth Edition. Illustrated. New York: William Wood & Company. Price, \$4.50.

GONOCOCCAL INFECTION IN THE MALE. By Norman Lumb, O.B.E., M.B., B.S. (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.). Illustrated. New York: William Wood & Company. Price, \$6.00.

AMERICAN RED CROSS AMONG THE FRENCH PEOPLE. By Fisher Ames, Jr. New York: The Macmillan Company, 1921.

Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

Maj. Henry R. Carstens, M. R. C., U. S. Army.

Lieut. Emil T. Cherry, M. C., Penna. N. G.

Maj. Stanton A. Friedberg, M. C., U. S. Army.

Capt. Malcolm Gunn, M. C., U. S. Army.

Dr. S. J. Meltzer.

First Lieut. James A. O'Reilly, M. C., U. S. Army.

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PHYSICAL EXAMINATION WITH SPECIAL REFERENCE TO THE CHEST AND TO MILITARY PRACTICE

By A. L. BENEDICT, A.M., M.D., F.A.C.P., BUFFALO

Late Capt. M.R.C., U. S. A., Major, M.C., N.Y.G., Att. 74th Inf., N.Y.C.

MOST textbooks and lectures emphasize the great importance of inspection, even to the degree of pronouncing it the most important of all methods of diagnosis. Like the governmental propaganda that the western front was relatively unimportant in determining the issue of the war and that the war would not end till the summer of 1919 at the earliest, and perhaps not for many years, this reiterated estimate fails to impress the great mass of physical examiners and is more or less ignored in practice by the men who make it. Not a few blind physicians have done excellent work in physical examination. Inspection should not be neglected; it is really of great value, not only with regard to dermal conditions, general health, and nutrition, but as suggestive of internal conditions of the thoracic organs, though rather in the way of detective work and snap diagnosis than otherwise. For instance, the rounded contour of the supra-clavicular regions in soldiers, the flatness or angularity of the silhouette of the shoulder of the more used arm, the flat, slightly moving chest of the farmer, the lagging of the more affected side of the chest, the rapidly and forcibly striking cardiac apex, not to mention scars and deformities from disease and operation, restricted movement from pleuritic adhesions, nor to enter into the details of Mark I. Knapp's method of locating organs by "looking Indian" at the modifications which they cause in the respiratory wave. Inspection, however, is very likely to suggest abnormalities that do not exist and to lack the expected evidence of real lesions. In a military clinical test I was credited with having promptly diagnosed a case of dextro-cardia but criticised for not having used inspection. The fact was that inspection had been made, very briefly, and the site of the apex beat noted, or rather its absence on the left side as inspection and even palpation and auscultation may locate the apex beat on both sides in normal cases. To be perfectly honest, it was not so much the

hint from inspection that put me on the right track as the intuition that unusual cases were to be presented and the rumor that there was a case of dextro-cardia somewhere in camp.

PALPATION, including SUCCUSSION.—I have nothing to add to the classic teaching of these methods except to confess that they are even more likely to fail or to mislead than inspection, and more dependent upon corroboration by other methods; and that in comparing areas, I can do better by alternate application of one hand or knuckles and first phalanx than by simultaneous tests.

MENSURATION.—For diagnostic purposes, approximate mensuration included under inspection usually suffices, either to estimate respiratory excursion, absolute still dimensions or contour. The various ingenious devices for securing tracings of the chest in different planes and the studies of chest types, breathing types, etc., are valuable in a collective sense but do not usually amount to much in the practical examination of the individual case. In military examinations, measurements of chest expansion are required. It is surprising how much the personal equation enters into this simple measurement; differences of half an inch in absolute or expansive measurements being negligible. As the terms "exhale" and "inhale" are meaningless to many, and as individuals seem to be about equally divided as to which movement is meant by "breathe in" and "breathe out," it saves time to define and illustrate to each group. It is a mistake to suppose that respiratory excursion should increase with the absolute still measurements; on the contrary, a large chest requires comparatively little movement of the wall to secure an adequate tidal wave and the maximum excursion is usually not greater than for medium-sized chests. Indeed, there may be difficulty in auscultation because of the normal restriction of movement in large-chested men, and for reasons whose explanations do not seem satisfactory, farmers and those habitually lifting heavy weights, seldom breathe well according to the demands of the physical examiner. A barrel type of chest does not by any means necessarily indicate emphysema. An expansion beyond $3\frac{1}{2}$ to 4 inches is usually a mere gymnasium trick, swelling the muscles and lifting the ribs so as to throw out the upper part of the chest but not materially increasing the actual intake of air. Records are sometimes magnified by the out-and-out fake of catching the tape line under the arms. The largest expansion noted in some 2,000 different soldiers was nine inches, genuine so far as the latter expedient was concerned.

Very rarely indeed have recruits been rejected on account of inadequate chest expansion though inexperienced examiners often have difficulty in measuring the true expansion. For young recruits (18-19)

twenty-nine inches at expiration should be considered adequate and the insistence on thirty inches would exclude many otherwise satisfactory applicants who not only can perform military duties but are benefited by them. The logic of requiring an increasing expansion as the stature and size of the chest increase, may be questioned. A small inspiratory expansion for a large chest obviously means a disproportionately great increase of lung capacity and it is questionable whether the caloric and hence respiratory demand for any given effort is appreciably greater for a tall man than a short one. To put the matter in approximate figures, a 6-foot man with an expiratory measurement of 34 inches is, on the average, quite as well safeguarded by an expansion of 2 inches as is a 5-foot man with an expiratory measurement of 29 inches by an expansion of $3\frac{1}{2}$ inches.

PERCUSSION.—Desultory thumping of the upper part of the chest saves time and caters to modesty. It quite often reveals gross lesions which happen to be located to suit the convenience of the parties concerned. An examination which amounts to anything covers, and uncovers, the whole chest; preferably starts at the bottom; compares, like any other method correctly carried out, identical areas on the two sides; is fairly light, since the attempt to get the resonance of deep regions by heavy blows is not based on sound logic and defeats its own purpose by obscuring the tone; avoids the ribs and other bones, or at least discounts the peculiar overtones due to bone vibration; should be interpreted both by the sense of hearing and that of touch, especially in military practice which often cannot command quiet. Nothing need be added to the ordinary teaching as to the use of the fingers except that usually single-finger percussion should be employed, while the amount of work involved in military practice renders it almost necessary that one should learn to use at least the first two fingers of the right hand as plessors and those of the left hand as pleximeters. Ambidextrous percussion is desirable, but the writer confesses not to have carried it to the degree of practical use. He has had no considerable experience with artificial plexors and pleximeters and is rather prejudiced against them. There is nothing that the writer can add to the general teaching as to the results of percussion except to emphasize the individuality of normal resonance, due mainly to thickness of fat and muscle but not corresponding exactly to these or other factors judged offhand. Possibly the personal equation is the only reason for holding that, in the past, too high standards of the diagnostic significance and reliability of differences in percussion note have been taught, while in other instances, our estimates have been too modest. Not considering gross consolidation of lung and fluid in the pleural cavity, dullness is

due, on the whole, to permanent changes in the lung and pleura which do not develop in active lesions but which remain after a practical cure. Apical dullness is a very common condition in apparently healthy persons and by no means disqualifies for military service. Hence, mapping out of the isthmus—which is not an isthmus in any anatomic sense—or of the supra-clavicular part of the lung, though often striking, is not very significant. It seems probable—and is at least true in the writer's case—that too much reliance has been placed in the past on our ability to distinguish minor differences of percussion note and that too great significance has been attached to them, at least with regard to active disease. On the other hand, our ability to detect old pleuritic thickening, to locate the heart, arch of the aorta, etc., by ordinary percussion, is greater than was formerly held.

Auscultatory percussion would require too much space to discuss here. The writer has been a firm believer in it for twenty-five years, but it has its limitations and liability to error like any other procedure and has had its reputation damaged by two factors: absurd claims made for it by the overenthusiastic and the failure of many excellent diagnosticians to realize that they could not pick it up quickly, like some detail of ordinary percussion and auscultation with which they were already expert.

It has occurred to the writer, as to several others, that absolute percussion pitch might be made a point of diagnostic value. The difficulties are that very few physicians are able to do more than detect very coarse differences of pitch, while the more acutely the sense of pitch is developed the less are the combined vibrations of percussion, sensed as a unit of definite pitch, subject to comparison with a musical instrument of definite pitch.

AUSCULTATION.—For examinations on any considerable scale, a stethoscope is almost an absolute necessity, even aside from esthetic considerations. The writer has for many years employed various stethoscopes with nothing but flexible tubes between the chest piece and the ear pieces. For any considerable amount of work a spring device is necessary to hold the tubes in the ears and one must even group examinations so as to avoid removing the ear pieces oftener than necessary, as otherwise the mere soreness and pain will prevent accurate work. In routine military examinations, where few abnormalities are to be expected, it is a good plan to do all the stethoscopic work on both hearts and lungs, on a line of five or ten men at once, having previously done the percussion in the same way. For deliberate office work it is well to change chest pieces and even to use several stethoscopes, but for routine examinations one cannot take the time to shift instruments,

change chest pieces or even standardize one's perceptions for chest pieces of different size. The cardiac chest piece is not only best adapted to cardiac examinations but is more accurate for pulmonary work. For example, in an influenza convalescent the writer found a beautifully typic pneumonic recurrence in an area almost exactly corresponding to this chest piece. It is true that the larger chest piece enables one to cover the lungs more quickly, but, for routine examinations of supposedly healthy men, sixteen sample areas, six in front, six behind, and four in the axillary regions, with a single breath in each, leave little chance of error, and the finer definition balances the chance of missing pathologic areas. For careful examination of the lungs, the small chest piece has obvious advantages though a little reconstruction of perceptive standards is necessary for those accustomed to the large chest piece. So far as the writer is aware, the only sounds in the chest which can be better heard by immediate auscultation are a few heart murmurs whose vibrations are nullified more or less completely by the essential resonance of the stethoscope—mainly aortic regurgitant murmurs. Aortic regurgitation is, however, pretty plainly implied by the pulse—though this is not necessarily typically Corrigan—and by other signs, and if, with this implication, the murmur is not heard, the ear may be used.

The Ford type of stethoscope, with small rubber or aluminum bell, heavy flexible tubes connecting to the spring ear pieces, is favored by military authorities. It can be used in quite noisy surroundings. The writer had been quite impressed with his own ingenuity in devising stethoscopes, and had used all sorts of modified instruments for special purposes, including home-made instruments in constantly changing states of dismemberment and reconstruction, and a portable instrument which had to be screwed into the ears for each part of an examination. He acknowledges with gratitude the military order to conform to standard and advises all with similar personal prejudices to do likewise. At the same time, in the more leisurely and individualized practice of civil life, there is a field for various types of instruments.

Except for a few details regarding the significance and exact limitations of certain recently suggested auscultatory complexes, it is doubtful if there is anything left to say about auscultation beyond what may be found in standard textbooks. Attention may, however, be called to a few points which have been impressed on the writer by military courses and clinical experience. If these are merely past or present confessions of ignorance, they may, nevertheless, be of value to others.

Somehow or other, many physicians carry the impression that pulmonary disease is especially to be looked for in the apices and on the

left side, at least so far as tuberculosis and chronic lesions generally are concerned. Without having attempted a statistic study it seems that this impression is rather the reverse of the truth. At any rate, the whole chest must be gone over carefully to ensure accurate results.

The main source of error—and this applies to every other diagnostic method, and to all organs—is not so much lack of skill as failure to perceive accurately. For example, an expert is demonstrating a case, his attention is not concentrated on what he is supposed to see or hear at the moment but upon presenting its academic features in a brilliant way, he may have an entirely different case in mind and perpetrate the most glaring errors. Or, in routine work, one may be thinking of the weather, of how soon he can dispose of a line of men, of some report to be made out, he goes through the form of seeing and listening, without really perceiving anything. Surprisingly often it is very difficult to get a patient to breathe so as really to make a sound and, occasionally, with a large chest, relatively immobile, and well padded with fat and muscle, it is almost impossible to make a satisfactory examination. One must, at least till the habit is thoroughly acquired, put his whole thought not only upon the particular case but the particular breath, voice-sound, or other phenomenon that he is nominally trying to elicit. He must repeatedly check himself by asking: "What did I actually hear (or see) at that moment?" If his attention was not properly fixed, if the stethoscope slipped, if there was some extraneous noise, if the patient did not breathe or speak or cough as he should, that detail of the examination must be repeated. It is no great hardship to listen to twenty heart beats and, in his gastro-enterologic practice, the writer has found that five or ten minutes of ordinary auscultation at one point will give very valuable and almost unappreciated evidence as to peristalsis and conditions which may be judged from it. But with absolute concentration of attention, especially after having sharpened his senses by 100 painstaking examinations in a day or two, one may get very definite information from a single percussion stroke, or a single breath or voice sound.

There are cases in which two or more observers or the same observe at different times get different results. Differences in pitch of percussion must be determined by listening from the front—though the exact reason is not apparent. Granted a fair degree of skill, divergent results, as for example when one man holds that one side of the chest is of a higher pitch and another that the opposite side is higher, or when after repeated tests the same observer is undecided, should be stated as doubtful or insignificant.

Auscultation of the lungs may be pretty sharply divided into three

objects of investigation; the degree of tubularity of the sounds, the constriction of tubes so as to produce musical tones, sibillant and sonorous or intermediate, there being no general term covering these words; adventitious sounds mainly due to the bursting of bubbles of liquid of different degrees of viscosity. Sibillant and sonorous sounds are often spoken of as rales, like those of the last group, but this is really incorrect. With certain broadenings of meaning, all auscultatory sounds of the lungs may be included in one or other of these categories. It seems questionable whether the expression "alveolar breathing" is correct. In other words, all breath sounds may be considered as tubular, the sounds being progressively modified toward the so-called alveolar type according to the degree to which they are transmitted through finer and finer tubes and extratubular tissue. It should be comprehended that tubular breathing, up to the degree of the establishment of an air passage of abnormally large size—a cavity giving rise to amphoric breathing—or any intermediate stage between tubular and alveolar breathing, is strictly normal, the practical point being to determine whether it is normal or not for the particular point examined. This matter is well covered in textbooks but it may be worth while to emphasize a few details. Until one has established standards of perception by examining a few hundred cases, the type of full tubular breathing and voice conduction should be called to mind in each case by listening over the temporal bone, trachea, and vertebra prominens. The alveolar type should also be set by examining over the bases and, if any doubt as to normality exists, by comparison with a normal individual. One should refresh his memory by reference to textbooks on anatomy and physical diagnosis of the boundaries of the lungs and of their lobes and especially of the course of the larger bronchial tubes. Usually, broncho-vesicular breathing, with the emphasis on the bronchial element, will be heard at about the second right interspace in front, near the sternum; at a corresponding but higher and more external location on the left side and with less marked bronchial element; close to the trachea in both apexes; in both supra-scapular regions behind and near the lower angle of the scapula, usually on one side only but not necessarily on either side exclusively. Voice sounds correspond in general with breath sounds. For this reason it would be convenient if we could use one word to cover both: for instance, could use some such expression as "bronchial element increased" or "bronchial element of the first, second, or third degree." While the above is approximately true, it is not possible to establish definite standards, either by descriptions or by perceptive memories. Individual differences cannot be accounted for merely by differences of shape of chest or of padding of

fat and muscle but seem to depend largely on variations of the courses of the main bronchial tubes, their actual size, and probably on factors of conduction which cannot be accurately explained either in general or for particular individuals. The writer has in a few instances ventured to diagnose a cavity in the second right interspace, in spite of the normal reasons for expecting a considerable degree of tubularity in the sounds at this point. On the other hand, he has frequently ignored bronchovesicular breathing in the supra-clavicular and supra-scapular regions. If the tubular element of voice and breathing is very marked anteriorly, the corresponding posterior regions are apt to approach the alveolar type, and vice versa. If the tubular element is consistently increased from the supra-scapular region down to the angle of the scapula, it is more probable that there is a fairly large direct bronchial tube near the surface than an actual lesion affecting conduction.

Diagnosis of pathologic conditions based on the tubular element of breath and voice sounds—which theoretically agree but occasionally differ practically—depends largely on the shape and location of the areas over which this element is heard. For instance, if it is in a narrow line, one naturally thinks of a superficial situation of a tube, while if the area is considerable in two diameters, it probably indicates a pathologic increase of conduction, mainly by consolidation of lung of some kind. The diagnosis is also made by the coincidence of other signs, as percussion dullness, presence of rales, X-ray findings, etc. Generally speaking, auscultatory sounds of the second group, sonorous and sibillant breathing, indicate inflammatory, spastic or possibly pressure interference with calibre, are only occasionally associated with consolidative lesions and are, usually, not indicative of serious disease.

While it is true that rales are always pathologic, their significance differs widely. Indeterminate mucus rales are, of course, apt to be associated with sibillant and sonorous breathing so that the expression "sibillant" or "sonorous" *rale* has some justification. The term indeterminate, while fashionable, is not a good one. Former terms, bubbling, coarse, mucus, clicks, etc., are more expressive descriptions, and it is questionable whether all rales can be satisfactorily classified into crepitant, subcrepitant, and indeterminate types. If they can, the indeterminate rale is just as determinate as the others. The crepitant rale has always impressed the writer as a good deal louder and more distinct than one would judge from the description, so much so that he has on various occasions had his diagnosis confirmed by others through the fear that he was mistaken as to its nature. Just how to distinguish the crepitant from the subcrepitant rale, as a matter of arbitrary definition or as an indication of differences in lesion, is also

a point which seems to require further consideration. Of course, if we accept the explanation that the former is due to the opening up of the vesicles or even the ultimate bronchioles, eliminate the former contention that it was pleuritic or concede only that it may be confused with very fine pleuritic friction or a pathologic increase of marginal sounds, the definition according to time of occurrence, toward the close of inspiration, is the crucial one. The exact definition and conception of subcrepitant rales also requires consideration. It is probable that the increased opportunities for observation of crepitant rales in military practice will throw considerable light on these problems. The writer's duties, and previous interests, have not been such as to afford any experience of value in this connection.

In two cases of irregular pneumonic recurrence in convalescence from influenza the writer noted crepitant rales and bronchial breathing and marked whispering pectoriloquy at the same time and site. This is contrary to the understanding that the rales precede the consolidation and probably is to be explained on the basis of a more recent pneumonic process underlying or possibly overlying one that had gone on to the stage of consolidation.

There are a good many problems, especially with regard to the relation of anatomic and pathologic designations of pulmonary diseases to bacterial causes, but it would require too much space to enter into them here.

The writer's military experience caused him some surprise with regard to pleural conditions, though this may have been due entirely to false notions gradually acquired. The typical friction rub of old pleurisy was never encountered in about 2,000 cases examined, some repeatedly. As this phenomenon is rather common even in the incidental examinations of a non-pulmonary civil practice, its absence is probably due to the youth and selected nature of the clinical material. On the other hand, easily appreciable dullness without active lesions was quite often encountered, and inquiry after establishing the sign usually resulted in a history of former pleurisy. However, it must be admitted that the patients (or examinees) occasionally located the old pleurisy on the wrong side or denied it altogether. Moreover, the laity as well as some physicians apply the term "pleurisy" to all sorts of painful conditions of the chest, including many not deeper than the chest wall. In many cases, the pleuritic nature of the condition causing the dullness was verified by lack of pulmonary excursion, even by X-ray pictures. In some, voice and breath transmission and tactile fremitus were diminished, while in others one or more or all were increased, without much consistency. It is quite conceivable that while a very marked

thickening of the pleura tends to diminish the transmission of all vibrations from the lungs, adhesion with slight thickening may increase it. Likewise, a thickening sufficient to diminish the feeble breath sounds may increase the conduction of voice sounds or the same vibrations as palpated but, as a matter of fact, all sorts of associations of these signs were noted, without any consistent adherence to theoretic explanation. The writer admits, also, that in quite a number of cases a somewhat musical sound was heard which might have been, so far as the writer's skill was concerned, either a pleuritic friction or a sonorous breathing. In all instances it was finally diagnosed as the latter, on account of its lack of permanence, though in several it was quite persistent, not easily eliminated by deep breathing and coughing, so that reexamination was necessary. The question arises, however, whether the pleuritic or bronchial source of a sound can be distinguished by its tone alone, by those of sufficient skill and training, without reference to permanence; and whether pleuritic sounds are really permanent. Of course a pleuritic friction sound requires a certain—or perhaps uncertain and varying—degree of respiratory excursion, so that it may be designated as permanent though not necessarily heard at every breath. It may be permanent in a practical sense and yet not of indefinite persistence and it is not impossible that more or less musical sounds similar to sonorous breathing may be produced by the rubbing of the pleural surfaces in quite transient inflammations. Gastro-intestinal movements may be heard in the examination of the lower part of the chest and may possibly lead to false conclusions.

THE HEART.—In spite of the present fashion to express contrary ideas, the principal practical means of determining the condition of the heart is auscultation, and mainly by the stethoscope. The value of various forms of recording devices is unquestionable, at least for the establishment of definite conceptions of cardiac physiology, but, on the basis of the knowledge thus derived, even the conditions broadly included as arrhythmias may be quite accurately distinguished even without apparatus whose expense and liability to get out of order are practical drawbacks to their routine use. Radiographic and fluoroscopic examinations have somewhat similar obstacles and it cannot be said that they correspond to demonstrable anatomic facts, except in a recondite sense, nor that they give the same information determined by auscultation. Warnings not to neglect the muscular condition of the heart, against measuring the degree of functional impairment by the loudness of a murmur, fairly accurate estimations of the seriousness of various valvular conditions, realization of the variability of murmurs, from time to time, distinction between organic

and functional murmurs, were included in the teaching of thirty years ago. It is unwise to try to secure proper attention to inspection, percussion, X-ray examinations, etc., and to the condition of the myocardium and the vessels by sweeping denunciations of auscultation. If cardiac auscultation were merely an academic matter, serving only to develop a nice auditory diagnostic skill, it would still be worth while, and anyone who would take the present denunciations of the stethoscope literally would be subject to denunciation in both civil and military practice and would be lacking in the performance of his duty to the patient.

The Surgeon General has issued two pamphlets, on the lungs and heart, respectively, which are ideals of concise summing up of scientific diagnosis and of common sense in their practical application. A monument ought to be erected to the men who compiled them and they ought to be familiar, in every detail, to every practitioner of medicine.

There is danger, however, that the practical distinction between systolic and diastolic murmurs may be taken too literally. A systolic lesion, especially with advancing years and the opportunity for the development of hypertrophy and subsequently dilatation, may be very serious. On the other hand, out of about 2,500 soldiers examined, some 15 or 20 diastolic lesions, mainly mitral, were encountered. So far as could be determined, none of the men had suffered subjectively, about half being of the minimum age, engaged in S. A. T. C. service which was not especially strenuous, the lesion apparently not having been discovered till the time of discharge. The other half were somewhat older, mainly accepted for limited service but subjected to excessive muscular strain. With regard to this latter half, the statement as to lack of subjective symptoms requires qualification. Some knew, in some way, of the condition, and there was the suspicion that others were concealing such knowledge in the hope that it might be overlooked and that the individual would then be sent over-seas. So far as I can recollect, failure of compensation was not noted in any case on duty when examined but such cases were occasionally seen in base hospital service, French surgeons also reported observations to the effect that diastolic lesions were well borne in the trenches. In civil practice I had a woman with aortic regurgitation who underwent five or six capital operations and lived at least twenty years after its discovery, working in a clerical capacity and showing practically no circulatory symptoms. Recently I have had a young girl who developed some form of cardiac lesion in early childhood, which was exacerbated during the influenza epidemic of 1918. She now has an

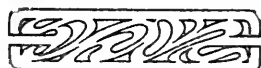
obstructive and a regurgitant mitral lesion, a large heart, and a pulse condition that may be considered auricular fibrillation. At the worst, about 40 per cent of the beats audible at the heart are palpable at the wrist; at the best, under medication, practically all of them are palpable. The systolic pressure ranges from about 125 for about 10 beats a minute down to, say, 100 for 40 or 50, and much lower for others. It is difficult to say what the diastolic pressure is. Yet this patient survived an intense, destructive streptococcic amygdalitis and is in very fair general health. Analogous cases are not especially uncommon. Still, for the majority of cases and for a period of, say, five years, the prevailing opinion as to the severity of diastolic lesions and their disqualification for military service is correct.

Tachycardia is rather frequently encountered in military examinations which, in my personal experience, have been mainly reexaminations of accepted men in the United States service and initial examinations for the New York Guard. Most of the moderate cases are clearly due to nervousness or recent exercise. Since the adoption of blank forms which do not require an absolute adherence to a normal count, nearly all of the cases held up at the first examination have proved to be persistent for the period of a month or so practicable for holding up a recruit for the Guard. Hyperthyroidism is apparently the correct diagnosis for a few; for the majority an analytic diagnosis has been impracticable, although a febrile reaction is occasionally the cause; in some hyperthyroidism is highly probable and it is always easy to indulge in glittering generalities as to the state of the myocardium.

Bradycardia I do not recall encountering in military examinations. It is fairly common in civil practice, but mainly among a different class of patients. I found it in a man of about 60 who gave a distinct history of a pulse of 40–50 for practically all of his adult life. At about the age of 75 the pulse acquired a normal rate of about 70 and, with temporary increases due to intercurrent affections, remained normal till his death at 90.

In common with many other medical officers I enjoyed a wonderful course in cardiac arrhythmias at Fort Oglethorpe. Even with the large amount of clinical material at the Base Hospital the course had to be mainly didactic. It is not surprising, therefore, that except for the normal "sinus" arrhythmia, no practical experience can be cited from military examinations of soldiers on duty and recruits for the Guard. Of course, some of the men with diastolic lesions had irregular pulses, but nothing of interest was encountered. In hospital work, especially as the aftermath of the influenza, and personally and in civil practice, some cases were encountered, mainly as an occasional extra-systole.

The only observations which can be considered as offering anything at all new are somewhat heterodox: An abundance of sleep and mental rest, with pleasurable exercise even of a degree that might seem excessive, as in dancing, swimming, etc., have been followed by recovery in several instances not accompanied by organic cardiac lesions as ordinarily construed. Such therapy is, of course, confined to civil practice. As to drugs, an equally heterodox suggestion may be offered: The more active cardiac tonics cannot well be administered for long periods, and great benefit has apparently been due to the use of cactus. Of course, the organic state of the heart, various toxemias, and other complicating or causative conditions must receive due attention.



Annual meeting at Boston, Mass., June 2, 3, and 4, 1921.
Headquarters at the Copley-Plaza Hotel. This immediately before the
meeting of the American Medical Association. Better come to both.

FOOD AT THE FRONT LINES

BY CLEON C. MASON (*formerly Major, Sanitary Corps*) and ALFRED T. SHOHL
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EARLY in 1918, five officers who were experts in food problems, were sent to France. Under the command of Maj. P. A. Shaffer, San. C. they were assigned as the Food and Nutrition Section, Medical Corps, to the Division of Laboratories and Infectious Diseases, which was in reality one of the major subdivisions of the Division of Sanitation, Office Chief Surgeon, A. E. F. On the basis of their recommendation twenty-five more officers of the Food and Nutrition Section and sergeants of the Q. M. Corps were sent to the A. E. F. The phase of their work dealing with combat troops is told here, based on experience in the 1st, 2d, 3d, 4th, 5th, 6th, 7th, 26th, 28th, 29th, 32d, 33d, 82d, 87th, 88th, 89th, 90th, 91st Divisions and the Corps Headquarters of the 1st, 3d, 4th, 5th, 6th, 7th, 8th, and 9th Corps.

Parties were attached on more or less permanent duty with corps or divisions. The parties consisted of an officer of the Food and Nutrition Section and several non-commissioned officers. They were in close coordination not only with the Headquarters, Division of Laboratories and Infectious Diseases by telephone and telegraph but also with division officers, especially Division Surgeons, Sanitary Inspectors, G-1 representatives of the General Staff, General Inspectors Quartermasters, and organization commanders. This allowed them to use their own resourcefulness and give such advice, make such plans and assist in carrying out such actions as the immediate occasion demanded. The work called for considerable detailed inspection of kitchens and instruction of the personnel individually, in groups, and in schools. As was to be expected the problem in each division was different but the main work was to see that the men received the food under the best possible conditions.

The nature of the ration in kind as authorized by G. O. 176, A. E. F. series 1918, cannot be discussed here. In general the garrison ration was consumed unless the field or other ration was designated by the commander. There were two days' reserve rations, which each soldier carried on his person. In addition, the unit combat wagon carried two days' field and one day's reserve, and the Divisional Supply Train two days' field rations. This made three reserve and four field, enough, if intact, to subsist the command for one week. These rations were never used unless a real necessity arose, for new rations were continually sent forward. While occupying trenches the soldiers were entitled to extra trench allowances in coffee, sugar, meat, bread, and

candles. It can be said that the food supply for troops in the A. E. F. was of uniform excellence and, with certain gaps and difficulties, always adequate.

THE GARRISON RATION

Meat.—The meat component was very well handled. Young, fresh, frozen, prime steers were delivered to the kitchens in better condition than to the average American home. With combat troops no inferior or spoiled meat was seen; a small amount needed considerable trimming. The supply was excellent and plentiful. Bacon was appreciated up to 20–25 per cent of the ration; greater amounts could not be utilized and found their way into the fire. At times no other than canned meats were available—roast beef, corned beef and corned beef hash. The canned meats were satisfactory and the amount issued was not excessive. Salmon was an article of food in which considerable wastage occurred; the American soldier will not eat more than a limited quantity of “Goldfish” (salmon).

Bread.—At all times the white bread and white flour were a source of wonder to the poilu as well as to *mam’selle* and *Fraulein*. The bread was the regular garrison (white) 2 lb. loaf. During the summer of 1918 a considerable amount of bread was lost, due to an epidemic of mould which resulted apparently from methods of handling, packing, and shipping in the French “40 hommes 8 chevaux” cars. Many organizations suffered, as the loss amounted to 100 per cent in some cases, and there was nothing to replace it. After the four pound oval loaf was substituted very little difficulty was experienced. We have seen this bread issued three to four weeks after being baked and still in good condition. Later the small, round, two pound loaf from the mechanical bakeries at Is-sur-Tille was also received and gave satisfaction. As for the hard bread, that packed in tin containers was very satisfactory; that packed in cardboard or the French variety packed loose in crates suffered considerable loss through moisture and mould.

Vegetables.—Fresh vegetables were often insufficient. They were substituted in part by dehydrated vegetables or by fresh vegetables bought locally. All the officers reported that both these alternatives caused trouble. The cooks had never seen dehydrated vegetables and had never, of course, received any instructions in their preparation. In some places no water for soaking them was available. As a result they were badly cooked. The fresh vegetables bought from the French and sent by the Regulating Officer, while very acceptable, were an almost total loss. The fresh tomatoes and cabbage especially, when they reached the front lines, were only 5–40 per cent fit for food. The fresh vegetables bought locally were of course much better. Fresh

vegetables were also available in rapid advances. In the Argonne large cabbage fields were a great help in supplementing the diet.

Fruit, milk and cereals were very short, both as allowed by the ration and as actually received. The pepper accumulated. The lard was excessive and went into the fires as an almost universal practice.

Other Rations.—When troops were in combat or advancing to combat the field ration was designated by the commanding officer. This consisted of canned meats in place of fresh and hard bread instead of soft. From the soldiers' point of view, it was otherwise indistinguishable from the garrison ration. The reserve ration carried on the soldier and in the field train, consisting principally of canned meat and hard bread, was never to be eaten except in an emergency; but practically, it was quite surprising how readily the American soldier made the emergency and the avidity with which he consumed a full day's reserve for one meal. The special trench reserve ration consisting of 25 rations sealed in metal containers was designated for trench warfare. It was meant to be consumed following a heavy barrage when rations could not be brought up to the men. Such conditions did not arise in the American Army and this ration was never utilized. The travel ration consisted of canned meat, soft or hard bread, canned beans, and canned tomatoes; sugar and coffee being usually supplied en route. This ration on the whole was satisfactory except for the supervision of its use in the trains. It was the custom for each man to open a can and eat until the contents were consumed. A sergeant should have been placed in charge of all the food in each car and have served it as needed.

The garrison ration delivered to the A. E. F., both as to quality and quantity marked an epoch in the feeding of armies. In many respects the ration was ideal. Probably better results are attainable in the milk and vegetable components by dehydration. The meat and bread components were present in such vast amounts and of such excellent quality that in this respect, the American food supply probably surpassed that of any previous army. The ration as delivered to the combat troops in France, in spite of decreased tonnage, submarine warfare, limited railroad transportation, storage, motor truck shortage and other difficulties was the envy and admiration of the Allies and a triumph of American achievement.

SUPPLY WITHIN THE DIVISIONS

The functioning of the supply and the system of automatic issue cannot be gone into here. Briefly, food moved through France from Base Depots to Intermediate Depots; from Intermediate Depots to Advance Depots; through the guidance of the Regulating Stations to

the Railheads and from the Railheads to the Divisions. The divisional supply organizations delivered the food to the separate organizations. The problem of supply within an organization caused more trouble than was anticipated. During the period at the front when accountability was removed, the supply officers, organization commanders, and mess sergeants assumed that the ration was: "What-ever we get." In many cases losses were not made good, spoiled goods were not redeemed and rations were sent to feed twice as many men as they were intended for. Part of this difficulty arose from the shortage of transportation. Part arose from petty thefts along the line of supply. No ration slips were available to check the supplies so that the more desirable articles had a tendency to disappear before they reached the front lines. The guards, stragglers, K. P.'s, etc., ate what jam and butter escaped the Officers' messes.

Ration Reports.—Ration reports were also responsible for certain delays in transportation and in getting the food to the men. It was customary for the daily strength report to be sent to the Battalion Headquarters, there consolidated and given to the Regimental Headquarters where it was again consolidated and given to the Supply Officer. The Supply Officer took the report to the Railhead as a basis for the ration return. The food was not issued until the next day and was not delivered until the third day when it was in the hands of the Regimental Supply Officer to be distributed to the Companies. The officers of one Division suggested that this line of communication could be reduced considerably by telephoning the daily report to the Railhead for issue the same day. This brought about considerable improvement because it eliminated the shortage of food resulting from detachments continually arriving at the front. These were often without food for three days unless they could take part of that meant for the troops already there. In the rarest instances did the Commanding Officer make provision for detachments sent forward.

The system for food supply was the daily issue. This allowed quick moves without involving much transportation of food. As can be seen from the following quotation of Maj. P. A. Shaffer, it was not without its difficulties.

"With the daily system of issuing rations now being adopted, I should advise that the Division Quartermaster should be allowed three days' rations to meet the delay in receipt of rations, and in order to minimize the breaking of packages. The division of sacks of flour, sugar etc., is wasteful and unsanitary, and should be avoided by the 'under and over' system of daily supply from the Division Quartermaster or from the regimental supply points.'

"Also, in my judgment, with the daily issues the whole of each ration article or the whole allowance of a substitute should be issued to an individual mess, rather than a part of ration article and part substitute. For instance 60 per cent beans and 40 per cent rice gives not enough of either for a meal and makes the making of menus difficult."

STOVES

No description of the food conditions would be adequate without consideration of the stoves for cooking. Many of the troops, when at the embarkation camp, had their field ranges taken away from them and on landing in France were practically without cooking equipment of any kind. This was all the more serious in the case of the National Army Divisions since what training the cooks had had in the cantonments was on hotel ranges. The Officers from the Food and Nutrition Section assigned to Divisions tried to assist them to make temporary substitutes such as rock ovens and mud ovens until rolling kitchens were available. There were four main types of rolling kitchen with which the doughboys struggled in the A. E. F.: the Magor, Steinbach, Taylor No. 29 and Taylor No. 30 and none was satisfactory. A detailed analysis of their shortcomings can not be given here. In the Army of Occupation a new type of rolling kitchen was provided and was far superior to those mentioned above.

The objections to the rolling kitchen are many. A good fire cannot be maintained and they can not be used for cooking while in motion. They turn out poor meals, as owing to the absence of ovens or poor ovens, the cooking is practically limited to frying and boiling. In service they have shown to be very hard on men and horses. They transport poorly especially when trailed behind trucks—the fire box breaks and the stoves shake apart.

The Army field range with the Alamo attachment has proved its advantage over all types of rolling kitchens. The men could set it up and cook a meal almost as quickly as they could prepare a meal on a rolling kitchen. It has good ovens. It can also be installed as a permanent kitchen and as such gives excellent satisfaction. During the time when troops are in trench warfare, in support, in reserve, or in rest, this type of kitchen is superior in every way. During a rapid advance there is a time when the rolling kitchen is invaluable; however, even under these conditions it is far from ideal. In the Argonne the kitchens were easily spotted by the enemy due to their smoke. As a consequence they drew heavy shell fire and many direct hits. The result was that the kitchens were grouped far behind the lines and the food had to be carried a long way. There is an important *but limited* use for any present type of rolling kitchen in combat.

MESS CONDITIONS

The great part of the work of Food and Nutrition parties was to improve mess conditions in the field. This required a major portion of the time of officers and sergeants. The policy was not to make an inspection followed by a report with only destructive criticism. Every effort was made to find out what was the matter with the particular mess and to give such advice and information as to overcome the difficulties. A great deal of time was spent in the individual companies instructing them in the elements of mess management, drawing of rations, storage, and in elementary problems of cooking and sanitation. In this way the officers were able to show the company commanders where the fault lay and the sergeants were able to give such instructions as would improve the cooking and reduce the waste. Small groups of mess sergeants were given informal lectures; circulars of instruction were issued for general distribution, temporary schools were put into operation. In addition the officers had many conferences and made such reports as were necessary.

Handling the Ration.—The training of the mess sergeants to meet actual conditions in the A. E. F. was very faulty. Nearly all were trained in the Cooks' and Bakers' Schools. A considerable portion of their time in cantonments and posts at home was spent in the purchase of food in the local markets and in the bookkeeping involved in the ration savings account. They did not know the ration allowance. They did not know how to make good their shortages. Few knew anything about the proper setting of a field range; none knew anything about the rolling kitchen. They were not trained in the proper handling of food under field conditions. They had not received sufficient training in field sanitation. They did not plan or keep their menus but turned over the daily supply to the cooks and K. P.'s. Their system of training resulted in the mess sergeants doing very little and using their time to poor advantage.

Cooking.—As far as making of menus is concerned, little was possible in a good many cases. It was sometimes merely a process of turning the food into "slum." The cooking in the A. E. F. was on the whole only fair. Not enough cooks were available to meet the demand of the Army. Cooks require considerable training, even with the best instruction, for proficiency. Too often these men were selected to be cooks because they had flat feet and were not available for line duty. They had never received training in field cooking or with the ration in kind. They had never seen a rolling kitchen until they were issued one as they went into combat. Then they were expected to cook without any ovens or griddles. The stoves broke and burned out, the utensils were

often short especially after a few months of field service and several troop movements, and replacements could not be obtained. The cooks had never seen dehydrated vegetables until they were issued in the A. E. F. and received no instructions in their preparation. These were badly prepared and the men were thus prejudiced against an excellent article of food. Fuel difficulties of green wood or no wood added to the cooks' troubles.

In the A. E. F. there were four cooks to a company; these were on duty twenty-four hours and then off duty twenty-four hours—two to a shift. It is felt that better results would be accomplished if the two cooks who get up for breakfast come on duty the next day in time to assist in serving the noon meal. Cooks should be trained to work under the conditions they must meet in combat.

Serving of Food.—Not enough time and attention were given to the serving of food. In rear areas a man should not be compelled to stand in line forty-five minutes to an hour before he gets his food. It cuts down his time for rest and recreation. If a company can be fed in a double line in three to five minutes, as it should be, it solves not only that problem but also the question of "seconds" getting in before the line is served. If all the cooks are on duty at meal time there would be better slicing and serving of meats and better seasoning of food.

In the front line the practice was to send the food up at night in Marmites or insulated cans. The British, French and German food containers were all designed to feed a squad or small body of men. The designers of the American food containers must have thought the men came to their meals in "company front" formations. The containers should have been much smaller so as to have been more easily carried.

Sanitation.—In general the kitchen sanitation was satisfactory in so far as the health of the troops was concerned but left much to be desired from the point of view of cleanliness and esthetics. The beef was piled up on the ground or on boards instead of being hung uncovered and trimmed. The bread was often put on the ground instead of being in bread boxes or the sacks hung up. The same is true of the bread crumbs. The sugar and flour were not in rat or vermin proof containers and to our surprise no loss from this source was reported. They did, however, often get wet. The vegetables were not so arranged that they could be picked over. In general mess kits were well washed. The garbage was not excessive in the A. E. F. and in several organizations well trained in this respect, as the 88th and 91st, waste was very small indeed.

Supervision of Mess.—An Army kitchen requires constant super-

vision to attain best results. This was supplied in the States in part by the Cooks' and Bakers' Schools. The transient and infrequent inspection by a nutrition officer had limited value. Constant attention to details is essential. Line officers and medical officers made such inspection as their time and qualifications permitted. The line officers who recognized the importance of the mess were usually entirely dependent upon the mess sergeant. Instruction and experience for line and medical officers in the principles and practice of cooking and serving of food would give them the technical knowledge necessary for intelligent supervision. This would permit the nutrition officer to aid them with their problems rather than to bring to their attention the elementary points. Many officers did not give the proper relative importance to the kitchen. They choose their mess sergeants because they were unsuited for the line to the obvious harm of the mess. They also were so busy with the many details of training, equipment, maneuvers, etc., that they spent their time on these problems, forgetting that the men fought once in a while but ate three times a day.

TROOPS UNDER MOVEMENT AND COMBAT

Advancing from a rest area to the front is usually accomplished with little trouble—the ground has all been marched over before, villages marked for billets, railheads already located, and rapid handling of rations made possible. The method used in such an advance is quite simple. Usually Divisional Headquarters moves once in two days. The same is true of the Railhead, which one day is in advance of the moving division, the next day in its rear. It means the supply train hauls one day to the organizations in the rear of the dump and the next day to the same organizations in advance of the dump. When secrecy of movement is a factor troop movement is accomplished at night. This "leap-frog" system allows of a semi-stationary headquarters and ration dump while the division continues to advance. Arriving at the front the advance railhead is passed and a ration dump established at some point further forward while troops pass to the line. In such a situation rations are hauled by truck from railhead to dump. In a country with many intersecting railroads as in France this is not usually a long haul; but when the roads are destroyed, as occurred in the Belgian Campaign, it may be necessary to haul by truck for 60 kilometers.

The actual food conditions in combat can probably be told best by the following quotations from reports of officers made on the spot.

ST. MIHIEL

"There is needed, especially in the line companies, a closer co operation between the Supply Officer of the Regiment and the various kitchens

of the organizations. In some cases the food was delivered all right to the kitchens, but the proper guide was not furnished the kitchen authorities, so that in some cases the food did not reach the men in action. At one Regimental food dump visited by our field party, food was piled in equal numbers of supplies regardless of the number of men in each company to be fed. Also the division of rations was not plainly separated, so that one organization did not know which was their share or where their share left off. No regimental issue slips were signed or given out at this particular regiment. Nevertheless the men in the 26th Division did not go hungry after obtaining their objective in this particular drive on the German trenches, because vast quantities of German foodstuffs were captured, such as oatmeal, unground coffee with roasted barley, soup in cubes two inches square wrapped in waxed paper, wrapping paper outside. The soup cubes consisted of cooked, dried vegetables pressed together. In case of beans, the beans evidently were previously cooked, dried, then powdered and pressed into cakes. Fifteen minutes cooking, according to the label, prepared it for use. The German fresh bread was dark in color and of a sour taste and odor. The bread appeared to be made of rye and graham flour, loaves being about fourteen inches long and six inches in diameter, weighing between two and three pounds per loaf. The hard bread was in small cubes about three-quarters of an inch long and one-half inch wide, slightly sweetened and of delicious taste. The Americans also captured and consumed a considerable amount of German canned beef, many barrels of beer, condiments such as dill pickles and other German food."

"Found by inquiry that two days' reserve had been issued for each man of reserve rations and that one day's reserve and two days' field was in the field train and the two days' field was held by the Quartermaster. From the talk of the infantry at the front the day before the drive started I judged that a great many men discarded their two days' reserve so as to be able to travel faster and not be hampered by any 'unnecessary' equipment. The day after the advance started the Division Q. M. moved the ration dump up to the town on the old line; from there the Supply Officer sent out trucks to the advanced troops. So rapid was the advance that the Supply Officer could only designate to the driver the distribution of the rations in the most general terms; they had completely lost liaison with their organizations and it seemed highly improbable that the ration trucks would find and deliver the rations to the unit for which they were intended. The congestion of all the main roads was very bad, the rations were delayed eight to ten hours between the railhead and the Divisional Dump with other traffic. On every side I saw rolling kitchens doing splendid work feeding whatever

troops were in the vicinity. Field ranges were also hastily set up and in use but it seemed to me that the rolling kitchen was by far the most practicable and serviceable method of feeding troops. With the congestion of traffic on the roads that seemed inevitable during a rapid advance it would seem necessary for organizations to depend for a few days on their reserve and field rations carried by the men and the field trains. Conditions of traffic and poor liaison are such as to indicate that supplies sent from the railhead or Divisional Dumps would not reach the troops for which they are designated for several days."

ARGONNE

"In spite of frequent movements, the railhead office and supply train have been functioning admirably though under great difficulties; there is not a full quota of trucks and since the recent advances the ration dump had to be changed frequently. In spite of this the food has always been on hand, distributed to the supply companies of the regiments and by them to the kitchens. The rations were unloaded at the railhead, through it to the ration dump and from there distributed to the kitchens. The kitchens were all together. They should be kept together, at least for a Battalion, the stoves kept more or less permanent, letting the front relief carry the cooked food three or four miles if necessary, but not further. In this way the kitchens would not become lost as happened more than once."

"On the first troop movement the soldiers of one regiment did not carry rations with them as they were instructed and so were without food. Again this was a common difficulty; for three days of the advance most of the men were not receiving any hot food, the kitchens had it and cooked it but were unable to find the men."

"Most of the organizations in the front now can only receive food in the night, they eat two meals a day and the food has been ample for these two meals. There has been an occasional shortage of some article of the ration due to the fact it had not been received at the railhead but on the whole the men have fared very well. When in reserve the companies have access to the rolling sales commissary where they buy oatmeal, jam, etc. One trouble in the front is the shortage of water and particularly for this reason it is hard to utilize dehydrated vegetables, fortunately fresh vegetables have been issued frequently during the past week."

"Due to the difficulties of the attack and progress afterwards (shell fire, bombing, rain, etc.) it was practically impossible to get any food forward for 36 hours—that is late on the afternoon of the 27th of September (the attack commenced at 5:30 A. M. on the 26th) when wagons were pushed ahead with corned beef, baked beans, hardbread and jam.

Due to the crowded conditions of the roads, filled with ammunition trucks, advancing artillery and ambulances no rolling kitchens could be carried forward for some time. It became necessary for the men to subsist on what they could get, and as most of the soldiers, as before stated, had eaten the entire reserve, they were hungry before food could arrive. As the attack gradually developed into an enemy retreat, order began to come out of the first few chaotic days, the roads were rapidly repaired and within four days rations were going forward quite regularly—canned meats, potatoes, beans, coffee, milk, etc. No fresh beef and no bacon were received until the division was withdrawn, when the beef component arrived, but bacon was not received by the division until late in November, nearly two months."

"Kitchens were placed in any sheltered location available. The military phase of these movements were preparations for a surprise attack. Men bivouacked in the forest of Hesse—under cover, all smoke was avoided—all lights at night were carefully covered. Usually cooking was done in late afternoon and the food sent forward in marmites. Some kitchens were two kilometers from the organizations, others closer, while one kitchen was located in a cave within five hundred meters of the trench. Rolling kitchens had been supplied by this time, but most cooks preferred to set up and use the field range. The food offered little variety; dehydrated vegetables, corned beef, bread, jam, dried fruit and coffee; these were the chief items."

"During this time considerable attention was given to the reserve rations on each man, it being desired that no man go over the top without the reserve. One of the striking things about the American soldier is his utter disregard for the future as shown by the avidity with which he will eat two days' reserve ration for lunch on the first day, throw away his slicker the minute the sun appears, chuck his blankets when going gets hard, and then go hungry, cold, and wet and cheerfully blame the whole affair on someone else."

From the nutritional point of view it is an interesting fact that the men under actual combat conditions as in the Argonne Drive, when it was not possible for kitchens to be brought up nor food to be supplied and when they received only one meal a day, did not complain seriously about being under nourished. Part of this may be ascribed to the excitement of battle and part to the splendid morale of the American soldier. However, these conditions of rapid advance and intensive open fighting were really only in evidence in the Argonne. The actual time spent under these conditions was short and unimportant from the physiological standpoint. No one suffered from lack of food. Not forgetting the minor mistakes and difficulties there is no other possible

conclusion to draw than that the American soldier received a splendid ration, of excellent quality and always at hand.

SUMMARY

1. *The Reserve Ration* is at present unsatisfactory. It wastes food as hard bread and does not contain the proper components for a ration to be carried by the soldier. A permanent package that will fit in the haversack containing several articles, constituting one complete meal,—three to the ration—is urgently needed.

2. *The Rolling Kitchen* should be greatly modified or superseded. It must, 1st be as usable as the field range, 2d, be motorized, 3d, be rubber-tired, light, and set on springs, 4th, be equipped with sufficient utensils, including a griddle, oven, meat and serving table and containers capable of withstanding heat, and 5th, be oil burning to avoid being detected.

3. *The Marmite Cans* or food containers should be of size sufficient to feed a squad or small detachment.

4. *Mess Sergeants and Cooks* were not selected with due regard to their ability or qualifications. Their training was not such as to fit them for greatest usefulness under combat conditions. They should receive better instructions in the use of the ration in kind and the messing of troops under field conditions. K. P.'s should not be changed daily and kitchen police duty should not be used as a punishment.

5. *Commanding Officers* paid too little attention to the kitchens, were not thoroughly conversant with the ration, and were inclined to let the Mess Sergeant struggle on. As now organized a Company Commander and his officers had a great deal to do, the company was large, and men had to be trained for fighting. The kitchen suffered. Too often inspections were cursory, resulting only in destructive criticism. Company commanders should receive instruction in the feeding of men and mess management.

APPENDIX

G. H. Q., AMERICAN EXPEDITIONARY FORCES, GENERAL ORDERS NO. 176.

FRANCE, Oct. 11, 1918.

1. On and after November 1, 1918, the kinds and quantities of the components of the rations and the substitutive equivalent articles which may be issued in place of such components to troops of the A. E. F. shall be as follows:

2. THE GARRISON RATION

COMPONENT ARTICLES AND QUANTITIES		SUBSTITUTE ARTICLES AND QUANTITIES	
Beef, fresh.....	20 oz.	Mutton, fresh.....	20 oz.
		Beef, fresh, boneless.....	16 oz.
		Bacon.....	12 oz.
		Pork, fresh.....	16 oz.

COMPONENT ARTICLES AND QUANTITIES

Bread, soft..... 16 oz.

Baking powder..... 0.08 oz.
(To be issued only with flour or cornmeal, 1 oz.
to 20 oz.)Beans, dry..... 4 oz.
(Not to exceed 4 issues in 10 days.)Rice or hominy..... 2 oz.
(Not to exceed 6 issues in 10 days.)

Potatoes, fresh..... 20 oz.

Potatoes, fresh..... 20 oz. (continued)

Jam..... 3 oz.

Coffee R. & G..... 1.12 oz.

Sugar..... 3.2 oz.

Milk, evap., unsweetened..... 1. oz.

Vinegar..... 0.16 gill

Salt..... .64 oz.

Pepper, black..... .02 oz.

Cinnamon..... .014 oz.

Butter..... 0.5 oz.

Flavoring extract, vanilla..... .014 oz.

Candy..... 0.3 oz.
(Issued $\frac{1}{2}$ lb. once in 10 days)Tobacco, smoking..... 0.4 oz.
(100 cigarette papers for each 4 ounces smoking
tobacco.)

SUBSTITUTE ARTICLES AND QUANTITIES

Sausages, canned pork or Vienna..... 16 oz.
Canned roast beef or corned beef..... 16 oz.
Hash, corned beef..... 16 oz.
Fish, dried..... 14 oz.
Fish, canned..... 16 oz.
Cheese, not exceeding 10 per cent of total
issue..... 10 oz.Flour, cornmeal, oatmeal or macaroni in
lieu of an equal quantity bread, but
not exceeding 15 per cent of total issue.Beans, baked..... 8 oz.
(Not to exceed 4 issues in 10 days.)Onions, fresh, in lieu of an equal quantity of
potatoes, but not exceeding 20 per cent of total
issue.Tomatoes, canned, in lieu of an equal quantity
of potatoes, but not exceeding 20 per cent. of total
issue.

Canned potatoes..... 15 oz.

Other fresh vegetables (not canned) when they
can be obtained in the vicinity by purchase or
from U. S. Garden Service, or can be transported
in a wholesome condition from a distance, in lieu
of an equal quantity of potatoes.Dehydrated vegetables: to be issued only
in case fresh vegetables are not avail-

able..... 4 oz.

Corn, canned..... 12 oz.

Peas, canned..... 20 oz.

Prunes, or evaporated apples, or peaches, or
apricots, or figs, or dates, or raisins, in lieu of an
equal quantity of jam.

Syrup..... 0.64 gill

Tea, black or green..... 0.32 oz.

Pickles, cucumber, in lieu of an equal quantity
of vinegar.Cloves, or ginger, or nutmeg, or sage,
thyme or allspice..... .014 oz.Oleomargarine or lard or lard sub-
stitutes..... 0.5 oz.

Flavoring extract, lemon..... 0.14 oz.

Cigarettes (number)..... 4

Tobacco, chewing..... 0.4 oz.

3. The Chief Quartermaster, A. E. F., is authorized to grant such increase in ration, or to make such modification of the ration, allowed to troops not serving in front line sectors who are engaged in hard labor for long periods as he may consider necessary; provided that the cost of the ration as increased or modified may not exceed the value of the garrison ration by more than 10 per cent and that cash savings will not be paid. The need for such additional allowances or modifications will be investigated by the Director of Laboratories, Food and Nutrition Section, Medical Department, who will report the findings with recommendations to the Chief Quartermaster.

4. The following additions are authorized to the garrison ration for troops serving in front line sectors at the discretion of division or other independent commanders, when such troops actually occupy positions in contact with the enemy:

Entire year:

	Per cent	
Bread or its substitutes.....	10	
Coffee.....	33½	(To be issued in the form of soluble coffee—George Washington or equal, 0.25 oz. per ration.)
Sugar.....	25	
Candles.....	100	
Solidified alcohol.....	1 0 oz.	(To be issued only for heating coffee or food when other fires cannot be used.)

November 1 to March 31, inclusive:

Fresh beef or its substitutes.....	25 per cent., or canned soup 8 oz. per ration, or soup cube one (1.76) per ration.
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5. Division and other organization quartermasters are authorized and directed to purchase locally, with the consent of the local French authorities, and to issue in lieu of an equal weight of potatoes such fresh vegetables as may be obtained in good condition and at reasonable rates.

6. FIELD RATION.

COMPONENT ARTICLES AND QUANTITIES.	SUBSTITUTIVE ARTICLES AND QUANTITIES.
*Canned meats..... 16 oz.	*Beef, corned, canned..... 16 oz.
	*Hash, corned beef, canned..... 16 oz.
	*Beef, fresh, roast, canned..... 16 oz.
	*Fish, canned..... 16 oz.
	*Sardines, not over 25 per cent issue... 16 oz.
	*Bacon 12 oz.
*Potatoes, dehydrated..... 4 oz.	Potatoes, fresh..... 8 oz.
	*Dehydrated vegetables..... 4 oz.
*Soup cubes, one (50 gm.)..... 1.76 oz.	
*Hard bread..... 16 oz.	Soft bread..... 16 oz.
*Beans, dry..... 4 oz.	*Peas, dry..... 4 oz.
*Jam..... 3 oz.	Dried fruits..... 3 oz.
*Coffee, soluble (G. W. or equal—soluble coffee to front line troops only)..... 0 75 oz.	Coffee, R. & G. 1.12 oz.
*Sugar..... 3.2 oz.	
*Salt..... 0.16 oz.	
*Milk, evaporated..... 1 00 oz.	

COMPONENT ARTICLES AND QUANTITIES.	SUBSTITUTIVE ARTICLES AND QUANTITIES.
*Chocolates, sweet..... 1.00 oz	Candy..... 1 oz.
*Tobacco, smoking..... 0.4 oz. (100 cigarette papers with each 4 oz. smoking tobacco.)	*Cigarettes (number)..... 4
*Solidified alcohol..... 2 oz. (To be issued only to troops unable to use other fires for heating food.)	*Tobacco, chewing..... 0.4 oz.

NOTE.—Only the articles marked * will be issued to troops in the Zone of the Armies or for stocking field and supply trains of organizations en route to the Zone of the Armies.

7. RESERVE RATION.

COMPONENT ARTICLES AND QUANTITIES.	SUBSTITUTIVE ARTICLES AND QUANTITIES.
Canned meats..... 16 oz. (Corned beef, fresh roast beef, corned beef hash in 1 lb. cans. Sardines and canned fish in 1 lb. cans or commercial tin containers to net fractions of 1 lb.)	
Hard bread..... 16 oz.	
Coffee, soluble, (G. W. or equal)..... 0.75 oz.	
Salt..... 0.16 oz.	
Sugar..... 3.2 oz.	
Soup, cube, one (50 gm.)..... 1.76 oz.	
Solidified alcohol..... 2.0 oz.	

(To be issued only to troops unable to use other fires for heating food.)

8. SPECIAL RESERVE RATION.

The following special reserve ration in addition to the reserve ration is authorized for troops in active operations when approved by the division or other independent commander. These rations will be packed in galvanized iron cans, hermetically sealed, each can containing 25 complete rations as follows:

- 50 ½-lb. cans hard bread.
- 10 1-lb. cans corned beef.
- 5 1-lb. cans roast beef.
- 5 1-lb. cans corned beef hash.
- 4 1-lb. cans fish, canned.
- 4 ¼-lb. cans sardines.
- 25 rations sugar in bulk (5 lbs.).
- 25 rations coffee, soluble (G. W. or equal) (18.75 oz.).
- 25 rations salt in bulk.
- 50 oz. solidified alcohol.

9. The reserve ration and the special ration will be supplemented by any or all components of the field ration whenever possible.

10. TRAVEL RATION.

COMPONENT ARTICLES AND QUANTITIES.		SUBSTITUTIVE ARTICLES AND QUANTITIES.	
Canned roast beef.....	12 oz.	Canned corned beef.....	12 oz.
		Sardines.....	12 oz.
		Fish, canned.....	12 oz.
Soft bread.....	16 oz.	Hard bread.....	16 oz.
Beans, baked, canned.....	4 oz.		
Tomatoes, canned.....	8 oz.		
Jam.....	2 oz.		
Coffee R. & G.....	1.12 oz.	Coffee, soluble (G. W. or equal).....	0.5 oz.
Sugar.....	2.4 oz.		
Milk, evaporated, unsweetened.....	1 oz.		
Tobacco, smoking.....	0.4 oz.	Cigarettes (number).....	4
(100 cigarette papers with each 4 oz. smoking tobacco.)		Tobacco, chewing.....	0.4 oz.

NOTE.—Where arrangements can be made in advance for troops to be supplied hot coffee or tea or cocoa from canteens en route, the coffee, sugar and milk components of this ration will not be issued.

III. 1. The garrison ration will be issued in kind to all troops of the A. E. F. in so far as practicable. Rations herein specified other than the garrison ration will be issued under the appropriate conditions for which designated or applicable.

2. Instructions will be given from time to time by the Chief Quartermaster, A. E. F., stating the proportions of the various substitutes and the plan of issue of the rations supplied to the troops of the A. E. F.

3. All previous orders on this subject and all instructions heretofore issued, insofar as they conflict with the above, are hereby revoked. (2873-A-30 A. G. O.)

BY COMMAND OF GENERAL PERSHING:

JAMES W. McANDREW,
Chief of Staff.

OFFICIAL:

ROBERT C. DAVIS,
Adjutant General.



TYPHOID FEVERS AND PARATYPHOIDS

By DR. ALFRED MARTINET

(Three illustrations)

ALTHOUGH the war may not, up to the present, have brought about any sensational discoveries as regards biology, it has nevertheless caused many problems to be studied in this direction and has made considerable progress both from a medicinal as well as a surgical point of view. In particular, the study of typhoid fever, or to be more exact typhoid fevers and paratyphoids, has made great strides and has greatly benefited from the enormous physiopathological experience gained by the war.

The matter now seems ripe for a general review. The nature of paratyphoid diseases, the practice now adopted of preventive vaccinations, and the marked development of therapeutics are subjects little known to the general public who are unable to understand clearly these relatively new ideas.

The historical method may in this case be highly recommended as it brings into full evidence the successive approximations of science in search of greater knowledge concerning morbid affections, the daily study of which reveals the most complicated problems. It will enable us to go over the ground, in a few minutes, which human brains have taken centuries to fathom.

There is no doubt that typhoid fever has always existed. The descriptions of serious fevers by the old Greek and Latin writers confirm this point. But as a matter of fact, there was much difference of opinion which was not cleared up until the XIXth century for the following reasons:

The old writers (and by these we mean the pre-XIXth century authors) did not characterize or class the diseases according to their symptoms or their exterior phenomena; consequently (1) they confounded diseases essentially distinct as to their origin and their nature, as for instance typhoid fever and exanthematic fever which have nothing in common save a general state of stupor, of prostration and delirium (moreover variable) which has caused the name to be given to the disease (typhus), exhalations from the stomach, diminution of sensibility provoked by fever; (2) for the same disease, typhoid fever, for example, they described as many special diseases as the exterior signs showed diverse physiognomy; this is why we find typhoid fever described as inflammatory fever, malignant, putrid, bilious, mucous, dangerous, adynamic, ataxic, etc. It is what one might call the purely symptomatic quasi-prehistoric period.

It is known that at the beginning of the XIXth century, owing to the efforts made by a group of scientists, among whom should be mentioned Laennec, systematic and minute observations were undertaken covering the subject of anatomic-pathology (autopsies). This group of physicians succeeded in localising the characteristic organic lesions of the diseases and consequently of medically classifying them on a clinical basis (exterior phenomena) and an anatomic-pathological basis (lesions observed on the dead body). This anatomic-clinical period completely renovated the science of medicine; it was the origin of all modern scientific movements. As regards typhoid fever, more especially, Petit and Serres, Bretonneau and Trousseau, discovered that the constant lesions of typhoid fever consisted in a special alterant of the follicles of the intestine (Peyer glands); accordingly the first-mentioned scientists proposed calling it an enteromesenteric fever and the second-mentioned dothienenteric (pustule, furuncle, intestine), because they compared the intestinal lesions to furunculous eruptions. This long and patient work ended in a very clear anatomoclinic conception being obtained of typhoid fever which has been admirably defined by Grisolle in the following words which are still true today: "Typhoid fever or disease is a pyrexia automatically characterised by swelling, by a special alterant of the follicles of the intestine, as well as by an increase in volume, injection, mollities and sometimes even by suppuration of the corresponding mesenteric ganglions; lesions collecting together during life, relaxation, meteorism, sensibility and grumbling (of the bowels) in the right iliac foss, often of delirium, of a state of stupor and prostration, as well as of an eruption on the skin consisting of lenticular pink spots."

With rare sagacity Grisolle adds: "Of all the names given to this pyrexia we prefer those of pyrexia (fever) or typhoid disease as they have the advantage of prejudging nothing regarding the nature of the disease."

The period which followed, bacteriological period, showed how prudent was this restriction relating to the exact nature of the disease, for even though it did not add anything essential to the above-mentioned anatomoclinic basis it showed on final analysis that typhoid fever was a general infection due to multiplication in the blood of a specific element called Eberth's bacillus, usually found in the intestines, but which may exceptionally not be accompanied by any intestinal lesions (which we might add Trousseau had already recognized). The isolation and the culture of the specific typhoid fever germ and the idea of the septicemic character of the disease, must be, as we shall show, the starting point for any considerable diagnostic and prophylactic progress.

The said Eberth's bacillus is constantly found, therefore, in the cells, the blood, and the viscera. The diagnosis must therefore be based on a systematic search for this bacillus in the cells, the blood or the exudate, these being the most suspicious subjects, and which was done at first. In actual practice this search is a rather delicate one for various reasons: (1) The typhus bacillus—Eberth's bacillus—is very similar, morphologically, to the coli communis bacillus, a bacillus common to the colon and a saprophyte of the intestines. It is therefore impossible to distinguish these two bacilli by a mere microscopic examination, with or without staining, or in a wet or dry state; accordingly, it is necessary to employ much longer and costlier methods for distinguishing them: cultures and transplanting on suitable differentiating mediums. (2) In the cells the Eberth bacillus is associated with numerous microbean germs, in particular with the coli communis bacillus, whose presence hinders and often prevents the culture of Eberth, resulting in the necessity of culture artifices and suitable mediums. As a matter of fact, in the blood, the Ebert bacillus usually exists in a pure state, so that the culture of the blood, the hemoculture, was, and seemed likely to remain, the diagnostic process adopted for typhoid fever.

The process was, however, soon supplanted by the serodiagnostic which had an advantage over the others on account of its simplicity and much greater rapidity, which placed it within reach of all laboratories and the most modest clinics. It is based on this fact that the serum of people suffering from typhoid fever, or even in a convalescent state, possesses the property of immobilizing and collecting together in one pile, *agglutiner in vitro*, the Eberth bacilli in a bouillon. This reaction of agglutination, of capital importance, is a very common phenomenon and is not confined to Eberth's bacilli. As a general rule, it can be said that the serum of an animal which has been injected with a certain microbe determines a specific and elective agglutinant action on the said microbe. In other words, "one can distinguish the microbean species by the agglutinant action of a specific serum, i.e., whose action only takes place on the microbe injected in the animal." Bordet established it for cholera vibrio and the cholera serum. Gruber showed the generality of the phenomenon. To Professor Widal belongs the honor of having realized and codified the serum-diagnosis of typhoid fever.

The following is what it consists of: If one places under the microscope a young culture, in bouillon, of Eberth's bacilli, it is seen that all the bacilli are isolated and of an extreme mobility. If, on the contrary, a mixture is made of the said "bouillon de culture," and of a variable quantity of 1/20th, 1/50th, 1/100th, 1/500th, etc., of serum from a

subject suffering from typhoid fever, the microscopic examination of the mixture shows quite a different picture; the bacilli gradually immobilize and agglutinate, collecting together in more or less large piles separated by empty spaces. The agglutination reaction is specific (conditional on the percentage of the mixture which determines it) from the Eberth bacilli in the blood and, above all, from the existence of typhoid fever.

The sereological reactions of the typhoid, utilized from a diagnostic point of view, have naturally brought about the study of general hematological reactions determined by the introduction in the human organism of progressive doses of Eberth bacilli having undergone certain attenuant processes, and in endeavoring to use them in a preventive and curative measure. Wright in England, Chantemesse and Vincent in France, have more particularly studied these problems, and succeeded even before the war, and by different methods, in giving us antityphoid vaccines whose effective prophylactic qualities were soon proved by reference to the military epidemiological statistics. The name of Professor Vincent is more particularly known in France in connection with the question of antityphoid vaccination: (1) because he gave us before the war an effective antityphoid prophylactic vaccine; (2) because this vaccine, quite original, was distinct from others of the same genus on account of its very special *modus faciendi* (choice of varied strains of Eberth bacilli, emulsion in physiological salt of cultures on gelose during 18 hours at 38°, sterilization by mixture with ether well shaken up, elimination of the ether remaining by evaporation in a sand bath at 38-39°); (3) because he obtained in his laboratory at Val-de-Grace an organism resulting from the process of vaccine which fulfilled all requirements; (4) because by a continual propaganda, and himself a staunch advocate of antityphoid vaccination, he proved from statistics the effectiveness of the aforesaid preventive method, and in this respect he played an important rôle at the outbreak of war by being instrumental in getting Parliament to vote the law making antityphoid vaccination obligatory, and which was worth several army corps to the country. For the purpose of putting on record, we give the pre-war statistics drawn up by Professor Vincent, and which are highly instructive:

Bacillary Vaccine of Professor H. Vincent

	Non-vaccinated	Vaccinated	Death rate per 1,000		Mortality per 1,000	
			Non-vac.	Vac.	Non-vac.	Vac.
Oriental Morocco (1911).....	2,632	171	64.97	0	8.35	0
French Army (1912).....	447,159	30,325	2.22	0	0.30	0
Algeria, Tunis (1912).....	44,514	10,031	12.14	0.09	1.88	0
Oriental Morocco (1912).....	5,240	1,529	38.25	0	5.51	0
Occidental Morocco (1912)...	6,293	10,791	168.43	0.18	21.13	0.09
Colonial Army Corps (1912)...	11,961	1,045	6.34	0	0.58	0
Epidemic of Avignon.....	687	1,366	225.61	0	32.02	0
Epidemic of Paimpol (civ.)...	2,400	400	41.68	0	4.58	0
Epidemic of Puy-l'Evêque....	388	312	62.85	0	7.14	0

For his part, Professor Chantemesse, by long and patient work, perfected an antityphoid vaccine (emulsion in physiological salt of cultures on gelose (18 to 24 hours) sterilization at 56-57° during three-quarters of an hour, adding cresol) which has been very effective.

This well-demonstrated prophylactic action of antityphoid vaccines induced the physicians to take up the study of the application of the said vaccines not only from a preventive point of view, but with a view to the cure of typhoid fever—in other words, to vaccinotherapeutic experiments. Vaccinotherapy was much practised by Professor Chantemesse, and by Professor Vincent (autolysat sterilized by ether). If used with care and prudence, it fully justifies Dr. Vincent's contention formulated by him in 1913 as follows:

"On condition that one does not ask of it more than it can give, vaccinotherapy or bacteriotherapy of typhoid fever is an interesting method which frequently diminishes the intensity of the toxi-infectious phenomena, attenuates the gravity of prognosis, diminishes the frequency of relapses, and is even capable, although in only a few cases and among those sufferers treated at the beginning of the illness, to shorten the duration of the disease or suddenly check it."

The foregoing is a résumé of the evolution of the ideas prevailing in regard to typhoid fever. However, during the last few years, these comparatively simple and clear ideas have become somewhat complicated from the result of the evidences of clinical practice; typhoid states, comparable in all respects to true typhoid fever, that is, resem-

bling in an extraordinary degree from the point of view of symptoms and lesions, typhoid fever, but provoked by the multiplication in the organism of intermediary bacilli with bacilli common to the colon and to Eberth bacilli.

On account of this double parentage, the terms of paracoli-bacilli, and paracolobacillary fever, *paratyphus bacilli* and *paratyphoid fevers* have been proposed. It is the latter name, proposed by Achard and Bensaude, which has prevailed. Paratyphoid fevers are, in fact, clinically,

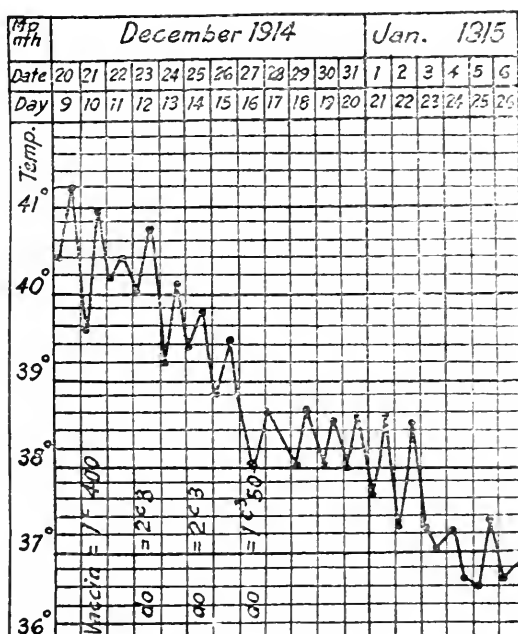


Fig. 6. Typhoid case treated by
Vincent's "Autolysat"

typhoid fever, but the agglutinant reaction (serodiagnostic) previously described, or the culture of the blood (hemo-culture) shows that the pathogenic bacillus, while being similar in a morphologic sense to the colibacillus as well as the Eberth bacillus, is quite different to them as much by its specific agglutinant reaction as by its fermentative properties, for instance its aptitude to cause lactine and glucose to ferment.

Eberth's bacillus makes purple glucose-gelose turn red but does not break it up; paratyphus not only makes it red but breaks it into fragments and produces gas.

The agglutinant reactions are specifically revealed (at least if the percentage of agglutination is taken into account); in other words, the serum of typhoids agglutinates the typhoid cultures at a relatively low percentage, and at a much higher percentage the paratyphoid cultures, and inversely.

This was the fairly exact position as to where we stood in regard to typhoid fever in July, 1914.

The new ideas expressed concerning paratyphoid fevers caused various differences of opinion; many physicians considered them of a purely theoretical nature and not capable of demonstration; the war, however, has proved that the matter is a practical one and these new ideas have assumed a prophylactic and therapeutic importance hitherto unsuspected.

As will have been seen, in this respect at least, the war did not find us unprepared. We were ready to fight this terrible deadly scourge, known by the name of typhoid fever, which, as we recalled in a previous article in *La Nature* (15 May, 1915, "war and epidemics"), caused more ravage in former wars than all the other traumas put together. The following figures will confirm our statement:—2d Danube Army Turco-Russian war: 7,207 died from typhoid fever, 4,613 killed by the enemy; Tunisian campaign: typhoid fever 4,039 dead, from other causes a few hundred; Transvaal war: died of disease, principally typhoid fever, 14,000, from other causes, 8,000.

In 1910, Professor Vincent made known his autolysat sterilized by ether, and the following year his bacillus vaccine also sterilized by ether. Following a report presented by the "Académie de Médecine," antityphoid vaccination was *authorized* in the French Army and Navy in 1911. It became *obligatory* in the Army in 1914 when the proposition of law lodged by Professor Léon Labbé was voted, and in the Navy November 11, 1914. Thanks to the untiring activity of the Sanitary Service operating with Professor Vincent's vaccine for the Army and Professor Chantemesse's for the Navy, the law was gradually applied and antityphoid vaccination was quasi-general at the end of 1914 and during 1915.

This enormous vaccination experience carried out on millions of subjects was bound to become the point of departure for many experimental evidences, some of them of a most unexpected nature.

The immunity, at least temporary, from typhoid fever was absolutely confirmed. For the purpose of record, we reproduce the graphic summing up of the results published by Dr. Javal regarding antityphoid vaccination in the corps. As will be seen, they are remarkable. About 50,000 men of this corps were vaccinated from

October, 1914, to February, 1915; the epidemic curve is almost strictly the inverse of the vaccinal curve; in other words, the epidemic, serious and alarming at the beginning, gradually died out in proportion as vaccination was applied. The number of lives saved for the country on account of these vaccinations can be estimated at several army corps. On the whole, allowing for a few contraindications, moreover very rare, and a few technical errors, these vaccinations were admirably borne by the troops.

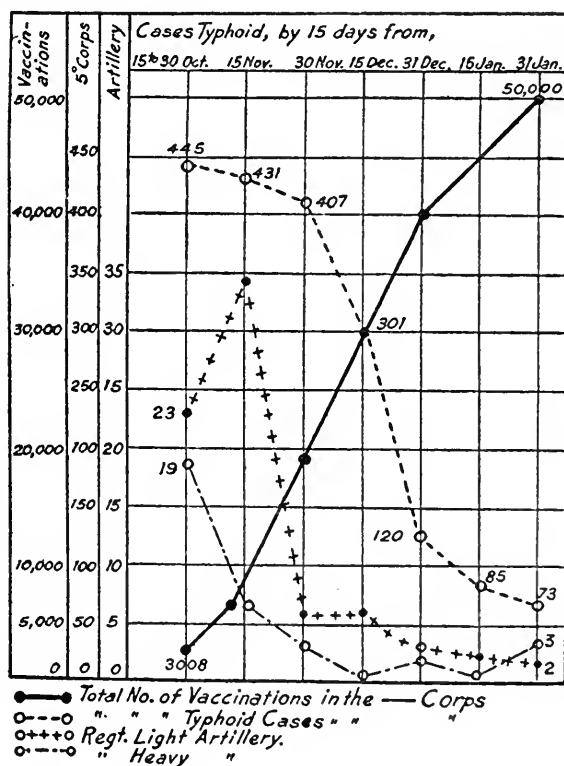


Fig. 8. Curves of Typhoid Cases and Vaccinations in an army in campaign.

However, to the great surprise and discomfiture of the Sanitary Corps, if the Eberth typhoid fever undoubtedly diminished in very large proportions, the paratyphoid fevers increased to an alarming extent, and this all the more so, it would seem, in proportion to the extent that antityphoid vaccination was performed and became generalized.

By reference to the diagram given below, drawn up by Marcel Labbé, it will be clearly seen that the number of paratyphoid cases

corresponds to that of the vaccinated subjects, while that of typhoid fever cases corresponds to the number of non-vaccinated subjects. Could it be that the result of vaccination merely replaced typhoid fever by paratyphoid fever? Even so, the result would not be negligible if one takes into account the relative mildness of this latter disease and its extremely low mortality (0 to 6 per cent according to the epidemic and the subject instead of 17 to 25 per cent for typhoid fever). But for the majority of people who have interested themselves in this question of vaccination of the troops, it is agreed that the practical result obtained "has been to reduce in a considerable proportion the morbidity and mortality caused by typhoid fever when considered from the larger standpoint of typhoid and paratyphoid affection." This, moreover, is perfectly evident from a study of Dr. Marcel Labbé's diagram.

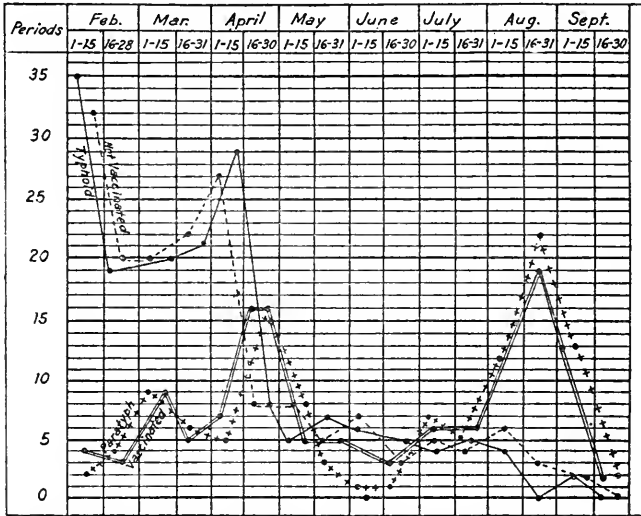


Fig. 9. Comparative curves of vaccinated cases and typhoid and paratyphoid treated in the same hospital. Note the similarity between the non vaccinated and typhoid and the vaccinated and paratyphoid.

It is nevertheless true that the paratyphoids which were considered before the war as exceptional have proved to be more frequent than actual typhoids, and this supports Widal and Courmont's contention "that here you have the greatest epidemiological fact resulting from the present war." Therefore anti-paratyphoid vaccination became a necessity. It was undertaken with the greatest facility by the officials by employing a triple vaccine containing a number of typhus bacilli equal to that contained in the ordinary typhoid vaccine and a number double the total of paratyphoid bacilli. A. and B. Wright, Widal and

Courmont, Vincent, and Chantemesse have perfected mixed vaccines which apparently fulfill all requirements.

This general practice of vaccination should, moreover, have a considerable influence on diagnostic methods. The serum of subjects vaccinated against Eberth, agglutinates not only the Eberth bacilli but also, even if at different percentages, the paratyphoid bacilli. From this fact the sero-diagnosis becomes very delicate if not quite fallacious. As a matter of fact, most scientists have reverted to the practice of hemoculture with transplanting on differentiating mediums. Bile seems to be a good culture medium.

If the prophylaxis of typhoid fever and paratyphoids has greatly developed under the influence of specific vaccinations, the treatment has made less progress. The bacilliotherapy, a curative treatment by methodical injections of cultures—so rich in promise—has not, up to the present, for various reasons, been sufficiently experimented with to settle properly its technical qualities and carry conviction. It is still being studied.

The same thing applies to treatment by injections of colloidal metals, and particularly colloidal gold.

Treatment by medicine has, in fact, remained traditional and symptomatic; the systematic cold bath treatment has given rise to heated discussions. Dr. Glénard has defended it with weighty arguments. On the whole, it would seem that it has undergone serious decline. The necessity of applying the balneotherapeutic treatment under unfavorable conditions has caused one to turn towards hydropathic practices which are easier to operate; continual application of ice on the stomach, on the precordial region, cold ablutions, wet packs, etc. On the other hand, tepid baths are preferred.

No doubt we shall come out of this war much better equipped from a prophylactic point of view and a curative point of view against typhoid affections, which year after year, even in peace time, took toll of hundreds of thousands of men.

La Nature, 3d June, 1916.

ACUTE EMPYEMA¹

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THE term "empyema" is derived from the two Greek words, *ἐν* and *πύον*, meaning "pus within"—but the term in itself is incomplete in that it fails to definitely locate the whereabouts of the pus. It is necessary to further qualify the word by mentioning the location of the exudate, as, for instance, "empyema of the gall bladder," "empyema of the antrum," "empyema of the pleural cavity." However, in the commonly accepted use of the term, and in the present discussion, "empyema" is taken to mean an accumulation of pus within the pleural cavity.

Its various synonyms are "suppurative pleurisy," "purulent pleurisy," "pus on the lungs." It is not synonymous with "lung abscess," which is an entirely separate clinical entity.

For the purpose of this discussion one may distinguish between "acute empyema" and "chronic empyema," elaborating other subdivisions as the discussion proceeds.

It is inconceivable that an empyema should be a primary process within the body. There must be some preceding traumatism, disease, or other condition that permits the ingress of the infecting organism or irritant. The etiology may be considered from two standpoints—one, the mode of entry of the infecting agent, the other, the organism itself. It is true that certain chemical irritants may produce a sterile purulent effusion in the pleural cavity, but such a condition would hardly be encountered clinically.

In considering the mode of entry of the organism two factors present themselves—traumatism and disease. Such injuries as penetrating stab wounds, gunshot wounds, and even fractures of the ribs, should they be compound or attended with laceration of the lung tissue and infection from the air passages of the lung, may provide a means of access for bacteria to the pleural surfaces. A possibility that must be borne in mind is diagnostic puncture carelessly performed, without due regard to asepsis. Like the peritoneum, the normal pleuræ may cope successfully with a small number of relatively avirulent bacteria. However, in all traumatic cases, there is the possibility of a hemothorax, which at once provides an excellent culture medium for such organisms as may have reached the pleural cavity.

¹ Based on lectures delivered to Medical Officers and Pupil Nurses at Walter Reed General Hospital, Washington, D. C., during 1919.

Of all the diseases which may be complicated by empyema the pneumonias are by far the most important. Pneumonia of one type or another was the etiological factor in approximately 75 per cent of the chronic empyema cases concentrated at Walter Reed General Hospital in 1919. Battle casualties were responsible for less than 25 per cent of the cases. Lobar pneumonia, broncho-pneumonia, hemorrhagic pneumonitis—all may be complicated by, or followed by, empyema. Pulmonary tuberculosis may be complicated by empyema. Unless protective adhesions have had time to form, the rupture of a lung abscess, or liver abscess, or subdiaphragmatic abscess, or mediastinal abscess, or the extension of a neoplasm of the lung, may flood the pleural cavity with an overwhelming infection. Empyema may be part of a generalized involvement of the serous surfaces in pyemia.

Of the microorganisms that may be responsible for empyema, the pneumococcus, streptococcus and staphylococcus are the most important. In civil life it would seem that the pneumococcus is encountered twice as frequently as the streptococcus, and that these two organisms are, one or the other, responsible for about seventy-five per cent of all the cases. In the military service, however, the streptococcus has been responsible for nearly eighty per cent of the post-pneumonic cases. Other organisms, ærobic or anærobic, may be primary or secondary invaders. The tubercle bacillus may be responsible for the empyemas complicating pulmonary tuberculosis. The pneumococcus and the streptococcus demand special attention, as being the principal invaders, and also because they give rise to clinical conditions that are wholly dissimilar to one another.

Empyema of pneumococcus origin is, in the typical case, a sequel to lobar pneumonia, occurring after the crisis of the original disease. Compared to streptococcus empyema, the exudate is relatively small in amount, accumulates slowly, is walled off early, and rapidly becomes frankly purulent. Bilateral empyemas rarely occur. The patient, having recovered from the pneumonia, can withstand operative intervention. The empyema cavity being walled off from the general pleural cavity, there is little or no possibility of collapse of the lung following open drainage.

Empyema of streptococcus origin is, in the typical case, a complication of a broncho-pneumonia, occurring during the acute phase of the disease. Compared to pneumococcus empyema, the exudate is large in amount, is rapidly poured out, filling the entire pleural cavity and preventing adhesions between lung and chest wall, is not walled off early, and does not become frankly purulent until after a lapse of seven to fifteen days. Bilateral empyemas, while not common, are more

frequent. The patient, being still acutely sick, is in no condition for serious operative intervention. In the absence of protective adhesions, early open operation is attended by grave danger of massive collapse of the lung and open pneumothorax.

The bacteriological diagnosis of every empyema should be determined before instituting operative treatment.

It is apparent that an empyema passes through a "formative" or "presuppurative" stage, which lasts for a variable length of time, depending primarily upon the nature of the infecting organism. It may last for two days to two weeks, and in any event merges gradually into the well-defined acute suppurative stage. This is not the opportune time for definitive surgical intervention.

Gravity will determine the location of the exudate within the pleural cavity in the great majority of cases, and it may be sought in the lower posterior region. Gravity will not determine the location in all cases. The accumulation may be peripheral or medial, it may be interlobar, at the apex, or between the diaphragm and lower lobe. As a rule there is but one empyema cavity; on the other hand, there may be multiple small abscess cavities walled off from one another by pleural adhesions. This is more particularly true in cases of streptococcus origin.

Early diagnosis of empyema depends on keen clinical perception and watchfulness. In cases of thoracic injury and of pneumonia the duty rests with the medical officer to prove that there is no empyema, rather than to prove positively that there is such a complication. Increased pain, increased respiratory difficulty, cyanosis, continued unproductive cough, wide daily variation of temperature, recurrence of fever after the crisis of a lobar pneumonia, all strongly suggest an empyema.

Repeated conscientious physical examination should form the basis of the diagnosis. The signs are too well known to need more than passing mention—limitation of motion on the affected side, absence of Litten's sign, diminution or absence of vocal fremitus, impairment of the percussion note, even to flatness, suppression or absence of the breath sounds and spoken sounds over the area of the exudate. While these signs are typical in the cases with parietal accumulations, they are not so clear in cases with medial or interlobar pockets. The interpretation of the signs in hemorrhagic pneumonitis following influenza may also be difficult. It is in these latter groups that the X-ray will be of great assistance. It is very desirable, where the facilities exist, to secure daily bedside plates of all chests wherein there is an acute process, in order that obscure signs may receive more logical interpretation, and that deep-seated pockets may not escape detection.

An effusion may be diagnosed by physical signs and X-ray plates, but only aspiration will show the exact nature of the fluid, and permit of correct bacteriological diagnosis. Again it must be emphasized that bacteriological diagnosis is essential, for pneumococcus empyema and streptococcus empyema are different clinical entities and demand different schemes of treatment. Aspiration should be carried out without hesitation, but with the physical signs and the X-ray plates as guides to the location of the fluid, and with the utmost attention to asepsis. Due care should also be exercised to avoid the entrance of air into the pleural cavity.

It is conceivable that an empyema may go on to a spontaneous cure in rare instances. It is also known that an accumulation of pus may be tolerated by an individual for a long time—one case coming to Walter Reed had carried an undrained empyema for eighteen months. Such cases, as a rule, either develop a bronchial communication with the empyema cavity, and “cough up” the empyema, or spontaneously evacuate the pus through the chest wall, but never attain a frank cure. The prognosis depends upon the type of infecting organism and, to an even greater degree, upon the initial surgical care—for the treatment of empyema is essentially surgical. It is fair to say that not more than five to ten per cent of all empyemas should die, and that of the surviving cases, ninety per cent or more should be cured without passing into the stage of chronicity. Only logical, well-planned surgical intervention can effect these results. Such surgical care must be based on a thorough understanding of the mechanical factors of respiration in general, and of the exact condition of the individual patient in particular.

The mechanical factors underlying respiration are: (1) the closed pleural cavities, (2) the supporting framework of the chest walls, or ribs, (3) the muscular apparatus for varying the capacity of the intrathoracic space, notably the diaphragm, and to a lesser extent the intercostal muscles, (4) the elasticity of the lungs, and (5) the atmospheric air pressure. The pleural cavities are normally but potential spaces, and the atmospheric pressure, exerted through the upper air passages and the bronchial ramifications, balloons out the lungs with each inspiratory effort. Weight of the chest walls and the normal contractility of expanded lungs together form a force greater than atmospheric pressure, and the air is expelled from the lungs on expiration. The supporting framework of the chest walls makes possible the variations in intrathoracic capacity, and prevents collapse of the chest due to external air pressure. For normal respiration all the foregoing factors must obtain.

Should an opening be made through the chest wall, so that the pleural

cavity is no longer closed, but communicates freely with the outside air, it will naturally be apparent that atmospheric pressure will be exerted, not only through the air passages to balloon out the lungs, but also through the defect in the chest wall against the periphery of the lung. At once we have a force working to prevent the expansion of the lung. The respiratory embarrassment resulting therefrom will vary directly in proportion to the size of the defect. It has been proved that the normal mediastinal septum is not rigid, and therefore, to some extent, the same embarrassing force will be exerted in the opposite side of the chest. With the failure to secure free intrapulmonary ventilation by respiratory effort, asphyxiation must more or less rapidly follow. Therefore, although surgical dictum calls for the evacuation of pus, physiological limitation and necessity demand caution in opening the pleural cavity.

Theoretically, then, until it can be demonstrated that the empyema cavity is thoroughly walled off, and no longer coincident with the whole pleural cavity, the optimum treatment is such as will evacuate the pus, and at the same time preserve the closed character of the pleural cavity, interfering in no way with the muscular apparatus, the framework of the chest wall, or the inherent qualities of lung tissue. Furthermore, it must be well appreciated that no great operative steps can be undertaken until the patient has so far recovered from his pneumonia or initial injury that he is well able to withstand additional traumatism. There is no call for precipitate or "emergency" operation for empyema.

It has been remarked that the treatment of empyema is surgical. The surgeon has the option of many procedures, grouped under the following general headings: (1) simple aspiration by needling, or thoracentesis; (2) intermittent, "closed-tube" drainage; (3) intercostal thoracotomy; (4) thoracotomy with resection of a portion of one rib. In addition the following adjunct measures are open: (1) suction upon the contents of the cavity; (2) irrigation of the cavity; (3) the use of antiseptics within the cavity. Each procedure has its field of usefulness. Each has its limitations. No one of the above options is all sufficient in itself. The wise surgeon will make himself familiar with all, and then elect the course best suited for each individual patient.

Whether aspiration be accomplished by the Potain aspirator or by hand syringe matters little. In either case due care must be paid to asepsis, to slow emptying of the cavity, and to avoidance of injury to the lung by the needle. One essential that is often overlooked is to prevent influx of air through the needle. Aspiration does not open the pleural cavity, nor alter the normal relationship of cavity to atmospheric pressure. It involves no damage to the structures of the chest

wall. It is attended by a minimum of operative traumatism and shock. Repeated aspiration may possibly bring about a cure in a small percentage of empyemas, but this is not a practical working rule. Rather, it is a temporary measure well calculated to reduce mortality in the early stages of empyema and safely tide the patient over an acute pneumonia until it is possible to institute definitive surgery. To rely on aspiration alone as a means of cure is to invite recurrence of the empyema.

Repeated aspiration is peculiarly applicable to the presuppurative stage of streptococcus empyema, and to the early stage of purulent effusions following thoracic traumatism, and should be the procedure of choice until the empyema cavity has become thoroughly walled off, and the condition of the patient will allow more elaborate surgical intervention. Abscess of the chest wall may occur along the track of the needle.

"Closed-tube" drainage is nothing but an elaborate development of aspiration, wherein a small rubber tube, held airtight in the chest wall, takes the place of the needle. The tube—say 4 mm. in diameter—is introduced into the cavity through a trocar and cannula stab wound. On withdrawal of the cannula the tissues grip the tube airtight. A clamp closes the tube, except at such periods as it is desired to evacuate the contents of the cavity.

"Closed-tube" drainage, as described, does not leave the pleural cavity open, does not alter the relationship of cavity to atmospheric pressure, and causes practically no damage to the structures of the chest wall. It can be done under local anesthesia, and causes very little operative traumatism or shock. As the tube is clamped off between the periods of aspiration, the drainage is necessarily intermittent. It does, however, permit of suction, of irrigation, and of the use of antiseptics. It is attended by very low operative mortality, and by an appreciable percentage of reported cures. However, it is safer to consider this measure, like the classical needle aspiration, a temporary measure. It is of particular value in the presuppurative stage of streptococcus empyema, and in the initial stage of post-traumatic empyema, in that it permits of frequent withdrawal of fluid without needling on each and every occasion. It is of relatively little value in a thoroughly walled-off cavity.

Intercostal thoracotomy, without resection of rib, may be done under local anesthesia, but should only be done after definitely determining, by exploring needle, the location of the fluid. A relatively small opening may be made, into which a tube of about 1 cm. diameter may be fitted airtight, or a longer incision may be made, precluding the possibility of a tightly fitting tube

Intercostal thoractotomy may or may not leave the pleural cavity open to the effect of atmospheric pressure, depending on whether or not an airtight tube can be fitted in the wound. It causes very little damage to the chest wall. Even though it may be done under local anesthesia, it involves somewhat more operative traumatism and shock than the foregoing procedure. It permits of continuous drainage, and therefore may be considered a definitive surgical measure. If a tightly fitting tube can be placed in the wound, suction is possible. In any event, irrigation and the use of antiseptics are possible. The operative mortality will vary with the stage of the empyema, and may be high in early non-walled-off streptococcus cases and early post-traumatic cases. The percentage of cures is high, and the risk of recurrence should be relatively low. Efficiency of such drainage will vary, depending on the position of the wound with respect to the lowermost level of the cavity. If an adequate opening can be made and maintained in the lowermost angle of the cavity, cure should result without further operation. Intercostal thoracotomy, with wide-open wound, has no place in the treatment of early streptococcus cases, or other cases where no adhesions have formed between lung and chest wall. It is only applicable to walled-off cavities, and is not as effective as the freer drainage that can be obtained by resection of a portion of rib. Intercostal thoracotomy, with tightly fitting tube, is of particular value when suction is desired, and is applicable to any early case, regardless of the formation of adhesions, provided, however, that the patient can stand the traumatism involved. When judiciously aided by irrigation with antiseptics it may be considered the procedure of choice in all early cases. In long-standing cases it is of very little value.

Thoracotomy with resection of a portion of rib gives the freest drainage. It can be done under local anesthesia, but is a trying experience to the patient. The subperiosteal approach permits the neatest operation, but if the periosteal sheath is allowed to remain regeneration of the bone will occur. If this regeneration is not desired, the periosteal sheath must also be resected, and that necessitates loss of the accompanying intercostal nerve and vessel—a minor loss in comparison with the advantage of assured patency of the wound. For the purpose of draining an acute empyema it is sufficient to resect a portion of one rib. As in the case of intercostal thoracotomy, preliminary exploration by needle should locate the cavity, and effort should be made to reach the lowermost part of the cavity. Dependent pockets are a fruitful source of chronicity.

Thoracotomy with rib resection leaves the cavity open to the effect of atmospheric pressure, causes a permanent defect in the chest wall.

with possibly loss of intercostal nerve and vessels. It involves too much operative traumatism and shock for acutely sick patients, especially those in the early stage of streptococcus empyema. It permits of free and continuous drainage, and is *the* definitive surgical measure. It hardly permits of suction, but irrigation and antiseptics may be freely employed. The operative mortality will be high in non-walled-off cases, and in cases with active pneumonic processes. The percentage of cure should be very high, and the possibility of recurrence very low. The procedure is not applicable to early streptococcus cases, or to early traumatic cases. It may safely be used in the average pneumococcus case. It is the procedure of choice in all cases of long standing.

"Suction" implies the constant utilization of some force to gently withdraw the contents of the cavity. It also implies that the cavity is not widely open to the effect of atmospheric pressure, but is connected, by tightly fitting tube, to suction apparatus permitting of even greater "negative pressure" than that of the normal pleural cavity. Theoretically, as the exudate is withdrawn, the lung should expand and the cavity gradually be obliterated. Actually, if no air be present in the cavity, and if the lung be not covered by a dense fibrino-plastic layer, this expansion will take place. Accordingly, to derive the maximum benefit from "suction," early cases should be selected, and care should be exercised to exclude the entrance of air. It is of no value in cases of long standing where the periphery of the lung is covered with dense scar tissue. One great advantage is the ability to collect all the discharges into one receptacle, and thereby prevent the soiling of dressings, bed, and patient. In this way cases which in the past have justly been considered extremely dirty can be kept as clean as hernias and simple appendices. A definite contraindication to "suction" is the presence of a bronchial communication with the cavity, permitting continuous inflow of air from bronchial tree into the cavity. In such a case, not only will the desired effect of suction be nullified by the influx of air, but the force of the suction will maintain the patency of the bronchial communication and delay its healing.

"Irrigation" implies the washing of the cavity with some solution, either bland or antiseptic. Irrigation should never be done upon an anesthetized patient, and should never be ordered until the surgeon has assured himself that there is no communication between cavity and air passages. Sudden death has occurred. With the patient fully conscious, and in such position that the irrigating fluid may find easy escape from the cavity, small amounts should first be tried, and if no irritation occurs, larger amounts may be employed, and the position of the patient so changed that the fluid remains within the cavity.

Coughing leads to the presumption of bronchial communication, although pressure within the cavity may of itself be sufficient to cause cough and distress. It is not irrigation or the irrigating fluid that will aid in the cure of empyema, but the ease with which the cavity empties itself, therefore adequate provision must first be made for the return flow of the fluid. Irrigation with bland solutions is not as effective as irrigation with antiseptics.

Antiseptics are very valuable. However, it must be realized that an empyema cavity is unlike other wounds in which antiseptics have been used to good advantage in that the whole extent of the wound surface is not open to visual inspection. Therefore it is better to employ only the milder antiseptics. Many have been advocated, but of all, Dakin's Solution has given the greatest satisfaction. It is fair to say that it is the antiseptic of choice in all thoracic cases. One should not attempt the use of Dakin's Solution—or any other antiseptic, for that matter—without first studying its chemistry, its mode of action, and the most effective manner of application.

Eliminating other antiseptics from discussion as inferior to Dakin's Solution, it may be said that the use of antiseptics may be combined with any surgical procedure except classical needle aspiration, and may be employed in any given case, regardless of etiology, or stage of the disease, wherein irrigation may be safely performed. Bronchial communication is the absolute contraindication.

Theoretically, antiseptics will accomplish the sterilization of the cavity, and permit of its closure at a relatively early date. The theoretical object can only be attained if the cavity is properly prepared for irrigation (adequate dependent drainage, elimination of foreign bodies, elimination of diverticula and pockets), if the antiseptic is brought into contact with the entire wound surface, if the chemical action of the antiseptic is continuous, and if sufficient amount be used. Practically, it has been demonstrated that sterility may be attained in the average cavity by instilling 100 c.c. of Dakin's Solution, hourly by day, two-hourly by night, with the patient lying in such a position that the cavity must remain full for ten minutes after instillation. At the end of ten minutes ninety-five per cent of the chemical energy of Dakin's Solution has been expended, and the patient may resume any position that will permit of good drainage.

Carrel and his co-workers have developed the technic of "smear counting" for determining the degree of infection in any given wound, and have established the criteria for "surgical sterility" requisite to the secondary closure of wounds of the soft parts. In the closure of soft-tissue wounds, however, it is possible to approximate the entire

wound surface and obliterate all dead spaces. This is not possible in the case of cavities within the chest, and therefore it is wiser to employ a more delicate test for sterility than the "smear counts" of Carrel. Such a technic was introduced at Walter Reed General Hospital, in 1919, by Lieutenant Colonel Moschcovitz and Major Dunham, and has been since utilized. The following description is a verbatim quotation from a circular issued by the Post Laboratory:

Experiments carried on at Walter Reed Hospital have shown that the culture method herein described for the determination of sterility of cavities in empyema cases is far superior to the old smear method. It has been found that one organism as reported on a smear count is really indicative of the presence of at least 200 actual viable organisms, as shown by the culture method.

The technic is as follows: A loopful of pus (as nearly standard as possible throughout the entire series) is taken from the deepest accessible part of the sinus and thoroughly emulsified in about 0.5 c.c. of a sterile 1 per cent solution of sodium thiosulphate, contained in a small tube (1×7.5 c.m.). This solution counteracts any chlorine which may be present, which would be detrimental to the bacterial growth, and also acts as a dilutant for the pus. To this tube is added 1 c.c. of fresh, sterile defibrinated human blood, and the contents thoroughly mixed by rolling. The tube is then emptied into a sterile petri dish, 10 c.c. of melted agar, at 42° C., added, and the plates shaken until the contents appear homogeneous. The plate is then incubated for twenty-four hours at 37° C., and the colonies counted, two types only being recognized, hemolytic and nonhemolytic. Needless to say, all precautions necessary to exclude contamination of the specimen are observed throughout the process of taking the culture and making the plate.

A series of sterile plates extending over a period of seven days is considered a positive diagnosis of sterility.

It is at once apparent that this is a very much stricter requirement for "surgical sterility," but it must also be borne in mind that the successful closure of an empyema wound, leaving still within the chest an unobliterated cavity of from 50 to 250 c.c. capacity, is a more difficult surgical problem. When the required seven consecutive sterile plates have been obtained, the wound may be allowed to close spontaneously, if it be not more than 1 c.m. in diameter, or if it be larger, it may be closed by surgical secondary suture. The advantage of formal closure is the possibility of bringing the muscles together beneath the scar in the skin. In the experience at Walter Reed General Hospital during 1919 no failures resulted from the spontaneous closure or surgical closure of chests wherein the above requirements for sterility had been satisfied, even though demonstrable cavities existed at the time of closure. The cavities are eventually obliterated by the patient.

The surgical steps may be recapitulated from another viewpoint: In cases of pneumococcus empyema, where the general condition of the patient will permit of early definitive operation, and where the pus is walled off thoroughly from the general pleural cavity, the optimum procedure is thoracotomy with resection of a portion of one rib, done under local anesthesia, and followed by intensive irrigation with Dakin's Solution, until sterility has been attained, whereupon either spontaneous

or surgical closure of the wound may terminate the surgical phase of the case.

In cases of streptococcus empyema, where the general condition of the patient will not permit of any elaborate surgical steps, and where the empyema cavity and the pleural cavity are presumably coincident, the only safe early treatment lies in aspiration or "closed-tube" drainage, to be followed after the termination of the acute phase of the pneumonia by intercostal thoracotomy with tightly fitting tube and continuous suction drainage, until the cavity has become much reduced in size and has become well walled off. Then suction can be discarded and open drainage followed for the balance of the course. Throughout the whole course from the beginning of the "closed-tube" drainage, irrigation with Dakin's Solution is indicated. Of all types of empyemas, these streptococcus cases demand the closest control of sterility, if closure is contemplated.

In post-traumatic empyemas it will be of material assistance to introduce a tightly fitting tube through an intercostal stab in the lowermost part of the back, and to maintain suction from an early period, provided, of course, that there be no bronchial communication. Dakin's Solution should not be used in these cases unless the pleural surfaces are actually infected, and the typical changes of acute inflammation have taken place. Contact between Dakin's Solution and normal pleura will cause the destruction of the latter.

Throughout the early course, before firm adhesions have formed between lung and chest wall, it will be wise to keep the patient in a semi-upright position, inclined slightly toward the affected side, in order that gravity may assist in eventually localizing the cavity in the lower, posterolateral portion of the chest, where it will be most accessible.

To aid in the surgical care, certain general lines of treatment are important. Diet is the most important, especially for the post-pneumonic cases, which have passed through a period when all metabolic processes have been exaggerated. They require a high caloric diet—up to 3,500 calories per day—of easily assimilable food. Their diet should be prepared under the supervision of a trained dietician.

At the earliest possible moment the patients should be gotten out of bed and started on a course of graded setting-up exercises, with special reference to lung expansion, correction of faulty posture, and general development of the muscles of the shoulder girdle and the chest wall proper. Blow-bottles, or such substitutes as improvised spirometers, blow-pipes used in light jewelry welding, soap-bubbles, etc., are good adjuncts to the routine setting-up exercises, but by themselves will not take the place of the routine calisthenics.

The general hygiene of the ward is naturally important, especially the ventilation and the opportunity for getting the patients out of doors.

Finally let it be said—learn the mechanics of respiration, learn how to interpret X-ray plates of the chest, learn the chemistry of any antiseptic that may be used, avoid haste, but rather study each individual case, and then give to every patient the requisite personal attention that is necessary to bring these cases to a rapid successful termination. Their care can not well be delegated to others unless the surgeon's assistants have been trained in this very work. Their care does take time, but the results will well repay all the expenditure of time. Logical initial treatment and careful check on the progress of cases should vastly reduce mortality and almost entirely eliminate chronicity in empyema.



Annual meeting of the association will be held in Boston, Mass., June 2, 3, and 4, 1921. Meeting of the A. M. A. begins June 6. Bear this in mind.

REPORT OF A NEW TYPE OF HELMET

BY COL. S. H. WADHAMS
Medical Corps, United States Army

THERE is presented herewith translated extracts from an original article by Dr. V. Morax and Dr. F. Moreau entitled "Etiology of Ocular Wounds by Projectiles of Warfare." The article appeared in the *Annales D'Oculistique* of August, 1916. It discusses a subject which has become of immediate interest to the United States because of the entrance of that country into the European war. The authors are men of eminence in the medical profession and peculiarly well qualified to express an opinion because of their connection with hospitals where very large numbers of wounds involving the eyes have been treated.

The number of men who have become partially or completely blind as a result of wounds is very large. While the humanitarian interest in the question is, of course, uppermost, the economic side is not to be lost sight of. Anything which will aid in reducing the number of these unfortunate cases is of especial interest at this time. The authors of the article referred to above have analyzed 698 cases of eye wounds. They show that of this number, 303, or 43.4+ per cent of the wounds, were produced by very small fragments of different kinds of missiles. Of 341 shell wounds 170 or about 50 per cent were produced by small fragments and for the grenades and bombs an even higher percentage.

ETIOLOGY OF OCULAR WOUNDS CAUSED BY WAR PROJECTILES

BY MESSRS. V. MORAX AND F. MOREAU

The frequency and gravity of ocular wounds caused by all varieties of war projectiles in the course of this war have compelled the physicians to study the means of protecting the visual system and to try and realize for the eye sockets what has been obtained for the skull with the Adrian helmet. The problem is, however, not the same, and appears at first sight more complex. The aim of the study which we publish here is to precise one of the sides of it. Before researching how it would be possible to protect, it has seemed to us necessary to determine by statistic researches, based upon the facts that we have observed, which are the projectiles affecting the visual system and what is their usual mode of action. In fact, it is necessary to take note of the nature of the projectile, of its weight, and as it is not possible to suppose absolute protection but that we must be satisfied with relative protection, it is

of all necessity to know in what proportion lead and iron, large or small shrapnel pieces interfere with the injuries caused to the visual system.

If we take into account the proportion of ocular wounds in comparison with the totality of wounded and the number of ocular wounds which may be prevented by a protecting apparatus we will be able to understand the advantage which can be found in an ocular protecting apparatus.

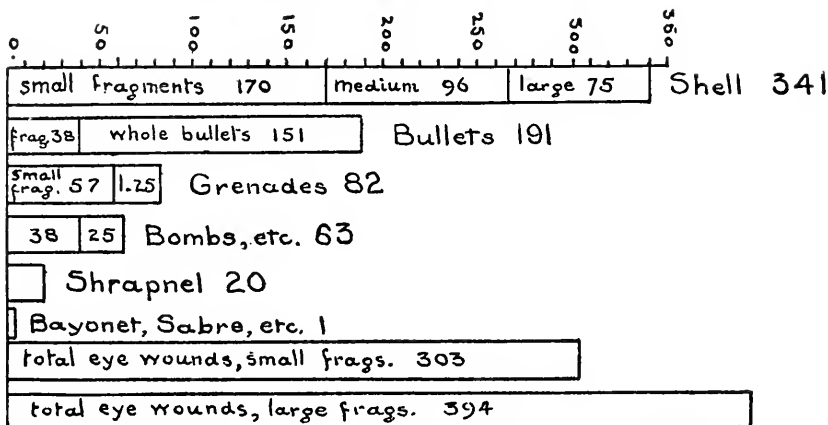
STATISTIC

The elements of our statistic are only taken from the ophtalmologic center of Lariboisiere (hospitalization and consultation service) that since September, 1914, had to cure the sick and wounded of the Army. The thing giving the value to it is not the importance of the number of the wounded but only the fact that conditions of observation have not changed very much in the course of the 19 months during which our statistics have been made. The notes which have been kept concerning each wounded allowed us to precise the special points upon which we desired to be informed.

Of the 2,000 soldiers which had been examined up to April 20, 1916, we will only retain 698. This number corresponds to the total of wounded presenting traumatic lesions of the visual system caused by a projectile or a war weapon.

Our first care has been to, establish the relative action of the different varieties of projectiles in the production of lesion without speaking of the nature of this lesion. In the following tableau we make no difference between the traumatic cataract produced by the penetration of a small shell fragment, the bursting of the orb caused by the penetration of a large fragment, the hemorrhages of the retina observed when a ball reaches the facial bones in the neighborhood of the orbit, or the fractures or contusions of the skull together with lesions of the visual centers or paralytic troubles of the oculo-motor nerves. We group the vulnerating agents according to their frequency:

Wounds caused by shell fragments.....	341
Wounds caused by rifle balls or mitrailleuse balls.....	191
Wounds caused by grenade fragments.....	82
Wounds caused by fragments of: bombs, petards, torpedo bombs, etc.....	63
Wounds caused by shrapnel balls.....	90
Wounds caused by bayonet.....	1



— Series of 698 wounds —

The frequency of ocular wounds by shell fragments is already clearly shown by this statistic in opposition to the extreme rarity of ocular wounds by bayonet.

As indicated in the foregoing, the mode of action of the vulnerating agents upon the visual system is practised in a most varied manner and it is interesting to examine, first in a general way, further at the special point of view of each projectile, in which manner are produced the ocular lesions.

MODE OF ACTION OF THE VARIOUS PROJECTILES

After having examined the general mode of action of the projectiles upon the visual system, it is necessary to indicate, for each projectile, the characteristics of its action in particular.

A.—*Shell fragments and trench engine fragments:* We have established a somewhat arbitrary division in classifying the vulnerating fragments in three categories; small, middle and large. This classification is necessary when the relative protection against wounds produced by these fragments has to be examined.

We will call a large fragment, a fragment the weight of which can be compared or is superior that of a ball; it is known that a German ball weighs 10 grams, the shrapnel ball weighs 8 to 9 grams. We only indicate the middle ones. All fragments whose weight is superior to 5 grams are ranged in this group. It is seldom that fragments of this weight reach the orbit only; they get beyond its two sides, injure the eye, go through the bony partitions, which are as thin as those constituting the superior maxillary sides, the maxillary rising branch and the bones of the nose.

When the fragment has not been retained by a more resisting bony partition, and consequently is no more there to be weighed and exactly

recognized, its volume may be inferred by the injuries it brought on. This is the way in which we acted to establish our statistic.

The weight of a small fragment does not exceed 0 gr. 25 to 0 gr. 30, but it may be inferior to 0 gr. 001.

Whatever may be the projection power of this small fragment it exceptionally penetrates deeply into the orbit. It, however, may go through the eyelid and the white of the eye and penetrate into the ocular globe, but once in the globe it will no more have strength enough to go back again through the wall.

The intraocular projectiles are generally of this category of small fragments.

As for the medium fragments, they are those which weigh between 0 gr. 30 and 5 grams.

These fragments bring generally the double perforation of the white of the eye. They may go through the teguments and the globe and then get caught in the orbit. They are generally retained by the bony partitions.

Fragments of 2 or 3 grams may no doubt go through the tissues contained in the orbit and then go through the internal orbitary wall.

When the ocular tissues are not injured directly by them, but the periocular tissues (eyelids, orbitary tissue, etc.) are attained thereby they frequently lead to injuries of chorio retinian contusions.

To complete this statistic the examination should be made of another category of fragments which is somewhat interesting and is characterized by a quantity of small metallic fragments constituting a metallic dust which tattoos the teguments of the face as well as the cornea and the conjunctiva and sometimes arrives to the iris where the binocular magnifying glass makes it clearly evident. We have seen some wounded by large shrapnel shells who showed this metallic ocular-palpebral tattooing.

After the foregoing, if we take over the 341 cases of wounds by shell fragments, it will be seen that they are divided in the following manner as regards the dimension of vulnerating shell fragments:

Large fragments.....	75
Medium fragments.....	96
Small fragments or dust.....	170

It can therefore be seen that the wounds caused by small fragments represent half of the wounds caused by shrapnel fragments. This is a statement from which it will be necessary to draw further consequences.

Ocular wounds produced by grenades, bombs, aerial torpedoes, etc., do not differ from the wounds by shrapnel fragments and one can establish the same difference between the small fragments and the others.

Ocular wounds by grenades are relatively frequent in our statistic.

Out of 82 ocular wounds by grenades 57 have been made by small fragments and 25 by medium or large fragments.

Out of 63 ocular wounds by trench projectiles 38 have been produced by small fragments and 25 by large or medium fragments.

By summing up the different cases of wounds by shrapnel fragments, grenades, etc., we obtain the following figures:

Total of wounds..... 486

Wounds by small fragments..... 265 = 54 per cent

One can thus affirm that more than half of the ocular wounds by shrapnel or trench engines is caused by small fragments.

B.—Rifle and Shrapnel Balls: Let us now consider the wounds made by rifle or shrapnel balls.

The ocular wounds are most of the time orbitopalbroco-ocular wounds, more often destructive when projectiles go through the socket. But it is often noticed that the vulnerating action of the ball on the ocular globe only takes place at a distance by the chorio-retinian contusion.

The following figures will precise the frequency of the case.

The total number of cases of wounds by rifle balls has been 191 and by shrapnel balls 20.

Ocular contusion injuries have been observed 55 times, that is to say: 42 times by the passage of a whole ball; 7 times by a ball fragment, and 6 times by the passage of shrapnel ball.

Out of the 191 wounds by balls, the greatest amount resulted from the whole ball, but in a proportion not to be neglected the ocular injury had been made by pulverization of lead or by small fragments of ball coating. When the ball meets the parapet, the rifle barrel or any other resisting surface, it is flattened and pulverized. The lead resolves in a series of small lumps, sometimes in dust tattooing the eyelids and the cornea and producing small penetrating wounds with traumatic cataract, etc.

In one-fifth of the ocular wounds caused by balls, they were produced by small fragments of rifle balls.

Total of wounds by rifle balls, 191. Wounds caused by whole balls, 153. Wounds caused by small fragments of balls, 38.

As to the wounds by shrapnel balls observed by us, they always brought (except in the six above mentioned cases of contusion of the globe) the destruction of the ocular globe, slits of eyelids and bony periocular injuries.

FUNCTIONAL CONSEQUENCES OF WAR OCULAR WOUNDS

The following figures will show the exceptional gravity of the wounds caused by war projectiles.

Out of 697 cases we may point out: 33 cases of skull traumatisms, 14 of which brought on a definitive homonymous hemianopsia; 623 cases of ocular traumatism which caused the loss of the wounded eye vision or a considerable decay of said vision, sometimes even the ablation of the eye has been necessary in consequence of the partial destruction of the second eye or of the dangers incurred by it, 293; loss of the visual power, or power equal or inferior to 1/20, 194; diminution of the visual power included between 1/10 and 1/20, 36.

Out of 697 wounded 160 only have kept or recovered a useful vision of the wounded eye. As we have already indicated several times, in reckoning the considerable capital represented by the visual system one can readily see of what importance are ocular wounds, taking simply into account the economic consequences brought on by them.

GENERAL CONSIDERATIONS ON THE PROTECTION OF THE VISUAL SYSTEM

Can the visual system be protected against the injuries caused by the projectiles mentioned above?

It seems to us that this protection can be realized if one does not pretend to make it absolute.

No portable sheathing will be sufficiently efficacious against penetration of rifle balls hitting the head right away, as it is quite necessary to have a protecting apparatus not too heavy to be worn.

The same observation applies to fragments coming from large shrapnels.

On the other hand, there are many wounds—almost the half of ocular wounds—for which protection may be obtained by means of a metallic wall made of zinc or lattice susceptible of resisting to the penetration of small fragments, and perhaps of medium fragments if the latter have already passed through a certain distance.

The efficacy generally recognized of the protection afforded by the helmet is also a relative efficacy; an important decrease of the skull-penetrating wounds has thus been obtained. For the visual system, it is also this relative protection that we want to obtain. The problem may be easily solved if it was only a question of the protecting factor, but the fighting man must keep his whole visual acuteness, or at least have it but slightly modified by the protecting apparatus placed before the cornea; the visual field must not be manifestly narrowed.

As to the medium or small fragments hitting tangentially the visual system after passing through the eye or the temporal region, a barrier may easily be established; one can also retain the small and medium fragments which reach in front of the eye, but for doing this one must make use of means which have, more or less, the inconvenience of lessen-

ing the clearness of the vision to such an extent that one may, strictly speaking, adopt a relative solution consisting in the obstruction of the temporal-orbital-nasal region by a protecting plate perforated with an orifice a little larger than the cornea. The vulnerable zone would be thus restricted by three-quarters.

It has been recognized that some form of protection for the eyes would reduce the number of cases of blindness. In other words, inasmuch as roughly 50 per cent of all eye wounds are produced by tiny fragments, there should be some practical method of prevention. M. Dunand of 72 rue Hallé, Paris, a well-known sculptor, has designed and patented a helmet which has this object in view.

The protection of the eyes is furnished by a slotted visor which is raised when not in use and when lowered covers not only the eyes but all the upper face. The slits in the visor of the model are wider than it is intended to have them in the manufactured helmet for the reason that they were cut by hand and were spread in the cutting. The helmet proper is of one piece of metal and all superfluous parts have been eliminated. In the regulation French helmet there is a slit in the top for ventilation. In the model submitted ventilation is provided around the headband as in a tropical pith helmet. Moreover, where the usual helmet is exceedingly uncomfortable this one has an arrangement of springs underneath the headband which permits it to fit the head comfortably. To one who has had to wear the heavy, ill-fitting regulation helmet this is a most important feature.

The question of how much the visor interferes with vision is an important one. I have requested the opinion of the Line Officers of the Mission on this point, all of whom are familiar with the conditions under which the enlisted man must go into combat at the front and all are agreed that it is negligible. The visor can be easily removed and the cockade on the side is removable and can be left off if not wanted.

Both the English and French Governments are experimenting with different helmets which combine some form of protection for the eyes.

The French have supplied 2,000 of the visored helmets to men at the front for trial. No report has been received as yet. The English, I have been informed, are trying out a helmet with a chain visor. What the results have been I do not know. Major Lyster, M. C., informs me that he has heard it highly spoken of. In any event, I am of the opinion that this helmet should receive careful consideration. One has only to visit a large hospital for eye injuries to feel that anything which can reduce the number of blind is worthy of most careful investigation. The increase in cost of the visored helmet is very small.

NOTES, EXPERIENCES AND SUGGESTIONS ON THE AUTOMOBILE AMBULANCE SERVICE OF A MOD- ERN ARMY IN THE FIELD¹

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Ex Chef de Section Sanitaire Americaine No. 5 (Harjes)

With two Illustrations

DEVELOPMENT AND CONSTRUCTION OF THE MODERN AUTOMOBILE AM- BULANCE AS USED IN THE FRENCH ARMY

THE outbreak of the European War in August, 1914, found the Ambulance Service of the French Army in the most antiquated condition, depending, as it did almost entirely, on horse-drawn vehicles of the type developed during the Franco-Prussian war, and including only two sections of automobile ambulances of twenty cars each.

It at once became evident that the automobile ambulance was the only solution for the handling of the sick and wounded under the conditions of a modern war, and though section after section of these cars were added to the French Army as rapidly as possible, a very long time elapsed before the service was anywhere near its proper strength, namely, one section of twenty ambulances for each division of infantry.

Under these circumstances, a great deal of assistance was, in the early part of the war, rendered by volunteers using their touring cars or cars with hastily constructed ambulance bodies.

These ambulance bodies very rapidly developed into two distinct types, the first of which, for the sake of convenience, will be called the American Ambulance type, the second the French Army type Kellner.

The American Ambulance type, built entirely on Ford chassis, was at first a four-stretcher ambulance, but as experience showed this to be too heavy for the light Fords, they were almost at once changed into three stretcher cars. The first of this type appeared about the time of the battle of the Marne and, with the exception of altering them from four to three-stretcher cars, the type has remained practically the same to the present day.

It was found that two alterations were necessary to the Ford chassis in order to make them suitable for ambulance service: Firstly, larger tires of equal size on all four wheels, 765—105, being the size recommended; secondly, one extra leaf in the rear spring.

The construction is sufficiently clearly indicated to require little description. Note, however, should be taken that the stretchers are not hung, but rest on their legs, either on the floor of the car, or, in the

¹ Based on nineteen months' experience at the front with the French Army

case of the upper stretcher, in slides, and that the crosspiece which supports these slides is removed and the slides themselves fold up against the sides of the car when the ambulance is to be used for patients capable of sitting up, four of whom can be carried and who are seated on two boards placed across the car as near the driver as possible. These boards when not in use are placed on the floor of the car.

The stretchers, when in use, and which are longer than the body, project through holes cut in the tailboard, these holes being covered with a canvas pocket. No provision is made for carrying the stretchers when folded and not in use, with the result that the men in charge of the ambulance usually carries them with one end resting on the floor, the other sticking out over the top of the tailboard, much to the discomfort of the sitting patients, if there happen to be any.

The chief advantage of a Ford for ambulance work at the front is its lightness and great clearance, and this type of car will pull through mud, fields, etc., which would leave a larger car hopelessly bogged. On the other hand, the experience of the writer, who had six of these cars in the section under his command, would seem to show that the chassis is not sufficiently well built, and rarely a day would pass that one of these six were not out of commission with some such complaint as a bent front axle or bent torsion rods, or leaky radiator, or occasionally the rear axle would snap off between the wheel and the end-bearing in the axle housing.

It must, however, be said that the American Ambulances, with nine full twenty-car sections of Fords in the field, have been most successful, though this is probably due to the excellent repair shop they have established in Kellners at Billancourt, and also to the fact that little attention is paid to the wastage in cars.

Another great disadvantage of this type of ambulance is the enormous overhang of the body at the rear, and the difficulty of keeping the seated patients when carried, in the end of the car near the driver, as, unless watched all of the time, they move to the rear in order to be able to look out.

The French Army type Kellner ambulance was much slower in developing to its present form and went through three distinct stages. The first of these may be called the angle iron canvas stage.

The construction of these bodies was most crude and gave little protection to the wounded being transported, who were smothered with dust in summer, and almost frozen in winter. This type, however, had one advantage, and one only, and that was that six stretcher cases could be carried, three on each side of the ambulance, one above the other.

The body itself was constructed of six upright U-shaped angle irons, with cross members at the top and bottom, those at the top being slightly sloped in order to give the necessary pitch for the roof. To these uprights twelve L-shaped angle irons were riveted with the flat side up, to form the rails for the rollers to which the stretcher hangers were attached. These stretcher hangers of leather also contained a strong spring, the idea being that this would help absorb the road shocks. The roof was covered with waterproof material, the front and sides being of canvas, the rear having canvas curtains to allow the ambulance to be loaded.

The manner of loading was unique, and required at least four men, the driver being inside of the car to assist. The loading would start at the top stretcher on one side, and continue until that side was completed, when the charging of the other side would be undertaken. This latter was considerably more difficult, as, after the top stretcher was in place, there was no longer room inside the car for the driver, so that the last two stretchers would have to be put in without any assistance from the interior of the car. The wounded man's head was always towards the front of the ambulance.

The actual details of the loading were as follows: All of the rollers to which the stretcher hangers were attached were pushed to the rear of their respective rails. The top stretcher was then lifted to arm's length by three men, two at the head and one at the feet. The driver inside of the car would then slip the loops of the stretcher hangers over the front handles of the stretcher, being careful to see that they were on as far as possible. The stretcher would then be pushed by the man at the feet and slide into place. The rear handles were fastened by chains ending in a hook attachment.

The unloading was accomplished in the reverse order, starting with the bottom stretcher, and was a much more ticklish operation, as the rollers would frequently jam on their respective rails, in which case the pull on the foot end of the stretcher would have a tendency to dislodge the front handles from the loops of the stretcher hangers, and it was only by the exercising of the greatest care that the stretcher with its wounded would be prevented from falling to the floor of the car.

Accommodation was provided for six sitting cases in place of stretcher cases by placing short planks across the rails provided for the lower stretcher. The full load of the Ambulance was therefore six stretcher cases, or three stretcher cases and three sitting cases, or six sitting patients.

The above-described system proved so unsatisfactory that the latter part of 1914 saw a new type of body designed by Kellner appear, which

has gradually been improved until it is now the standard for the French army.

The features of the exterior of these bodies is a fixed roof over the driver's seat, a large window in the front of the ambulance body itself, and two large windows on each side, all of these covered with canvas curtains capable of being rolled up. The rear of the ambulance through which loading took place was also covered by a canvas curtain.

This ambulance had a capacity of five stretcher cases, the lower stretcher being simply slid into place on its legs on the floor of the car, two small strips of wood preventing it from working out of position sideways. The upper four stretchers were all suspended, the stretchers being slid into place suspended from leather stretcher hangers fitted with rollers and moving along metal rods. These stretcher hangers were also fitted with heavy springs, similar to those mentioned in the description of the angle iron canvas type of ambulance.

The stretchers when not in use were rolled up and placed in the stretcher hangers in the center of the car, the stretcher hangers on the sides of the car being strapped together to prevent vibration, the noise of which was most annoying if this was not done. The body of the ambulance being much longer than the stretchers themselves, this arrangement was fairly satisfactory as the stretchers were entirely under cover.

Seating capacity was provided for eight patients, on two seats running lengthwise on each side of the car. The total capacity of the car was, therefore, five stretcher cases or two stretcher cases and four seated cases, or eight seated cases.

The loading of these ambulances was extremely quick and simple, and on account of the front and side windows, the operation could be overseen by the driver, who could thus easily prevent the rollers of the stretcher hangers from jamming.

Experience soon demonstrated that the most comfortable stretcher for the patient was that one placed on the floor of the car, and that a suspended stretcher was a fallacy, as the motion of the car caused it to swing sideways, and thrust backwards and forwards in the most violent manner, causing very great discomfort, and even danger to the wounded. Many makeshift arrangements were tried to prevent this, the most effective and simplest being to bore two holes in the side of the ambulance opposite the end of each stretcher, pass a thin rope through and tie the end of the stretcher to the side of the car.

Another great disadvantage with this form of ambulance was the cold in winter and the dust in summer. This latter was simply terrific, the patients being almost suffocated as it sifted in through the canvas

curtains on the sides and back of the car. On warm days, however, this could be partially prevented by raising the curtain of the front window back of the driver.

The final development of the French army ambulance Body type Kellner in general lines, is similar to the one just described, but has several important modifications: Firstly, the fixed roof over the driver's seat is replaced by a hood of the buggy type, which can be folded back. This is of importance as on dark nights, when driving without lights near the front, it enables the driver to keep on the road by looking up at the skyline which shows between the trees that invariably line the roads in France; secondly, the canvas curtains of the windows and back are replaced by wooden shutters. Those on the rear of the car have not given satisfaction, as, when the car is standing loaded on an uneven portion of the road, the body will warp slightly out of shape, and a great deal of difficulty is experienced in opening or closing the rear shutters; Thirdly, the four upper stretchers, instead of being suspended, all rest on slides, these slides folding up against the central pillar when not in use. This arrangement is most satisfactory, as it combines with quickness of loading the greatest amount of comfort for the wounded man himself. Large boxes are placed on each side of the car; these contain the reserve gasoline, the tools, and the driver's personal baggage.

No provision has been made in this type of body for the stretchers when not in use, but the writer sees no reason why a shallow box capable of containing them should not be placed in the seats which run lengthways along each side of the car, the top of the seat being the lid of the box.

Heating arrangements are made by turning the exhaust gases of the engine into a sheet-iron box placed in the floor of the body. This can be turned off and on at will and gives excellent results.

The capacity of these bodies is the same as the one previously described, namely, five stretcher cases, or two stretcher cases and four sitting cases, or eight sitting cases.

These bodies were placed on all makes and powers of chassis, but the writer, through personal experience and observation, is of the opinion that a chassis of from 12 to 15 hp. (European rating) gives the best results, as a high-power car is a luxury and not a necessity. This opinion is apparently being shared by the French authorities, as the later sections are all composed of 12 to 15 hp. chassis.

The chassis should have great clearance, with equal size tires and detachable rims on all four wheels, the section of the tires being at least four-and-one-half inches. The most desirable power plant is of the unit variety, having the engine and gear box in one piece, with the

flywheel encased in the casting of the motor base to protect it in case of hitting any abnormal object, such as a dead horse, etc.

Only the very highest grade of car should be used and it should have electric lights, as in frontal work the lights are continually extinguished and relit at very short notice. A self-starter is only a complication. An electric light should also be placed in the interior of the ambulance. Double tires on the rear wheels give excellent results.

A section which almost absolutely fitted the above description came under the observation of the writer. It was composed of 12 hp., Panhards, and with the exception of not having a very great clearance was certainly most effective.

ORGANIZATION AND PERSONNEL OF AN AMERICAN VOLUNTEER SANITARY
SECTION ATTACHED TO THE FRENCH ARMY

The sanitary sections of a French Army are not, as might be supposed, under the command of the ranking medical officer of that army, but have as their chief an officer under whose charge all the automobiles of the Army are placed. This officer, usually a major, has as his immediate assistants, two captains, who in turn are responsible for all of the automobiles of the two army corps which compose a French Army, one being assigned to each of the Army corps. It is to one of these captains that the officer commanding a sanitary section is immediately responsible.

The officers and personnel of an American volunteer sanitary section consist of, and are organized in somewhat the following manner, though the numbers vary slightly from time to time. The minimum time of enlistment is six months.

Commanding Officer: A second lieutenant of the French Army; *Bookkeeper:* A sergeant of the French Army; American Officers under the command of a chef de section; *the French Lieutenant:* a sous chef de section; *Personnel:* one chief mechanic (American); one assistant mechanic (American); one cook (usually a French soldier); one assistant cook (usually a French soldier); twenty-four Drivers (American); twenty-three Assistant Drivers (American); a French soldier who acts as chauffeur to the lieutenant commanding.

In Paris a bureau is established under the command of a French Army captain, whose duty it is to see that the sections are maintained to proper strength, that the recruits are suitable, and that the material is kept up to the proper standard of perfection, but this bureau has nothing to do with the operation of the sections in the field.

The French second lieutenant, the French sergeant, the French cook and assistant cook, and the chauffeur, all receive the usual pay and rations of their various ranks in the French Army.

The American chef de section receives from the French Army the lodging and rations of a captain, but no pay. The American sous chef de section receives the lodgings and rations of a lieutenant from the same source, but also receives no pay.

The American personnel of the section receives the pay and rations of a simple French soldier, the pay being five cents a day. They do, however, have an extra allowance made them by the organizations that are financing the undertaking. This varies from one franc per head per day in the American Ambulance Sections; to three francs in the American Red Cross. The mechanic and assistant mechanic are usually professionals and receive regular wages from the financing organizations.

A French officer not being allowed to drive his own car, the American chef de section and sous chef de section come under the same ruling, so that a driver is assigned to the staff car used by them.

The material and make-up of a section vary considerably, but the following may be taken as a very fair average:

One touring car: Used by the French second lieutenant, and in charge of the French soldier; one touring car: Used as staff car by the American chef and sous chef de section, and in charge of American volunteer driver; one large truck with trailer: In charge of American volunteer driver and assistant driver; one kitchen truck fully equipped with stove, etc: In charge of cook and assistant cook; one repair truck fully equipped tools, forge, vice, etc.; In charge of mechanic and assistant mechanic; one small light truck: In charge of American volunteer driver and assistant driver; twenty-one ambulances: Each in charge of an American driver and assistant driver.

Gasoline and tires are furnished by the French Army, the serious repairs being attended to in the shops established close to Paris, by the financing organizations, in the case of the American Ambulance at Kellners Billancourt, and for the American Red Cross, at Levallois.

Each car must carry enough gasoline and oil to be able to run three hundred kilometers, about one hundred and eighty-seven miles, and, besides a regulation list of tools, must carry two new exchange tires and four inner tubes. A further reserve of one tire for each two cars is carried in the camion, which also carries the working supply of gasoline: about one thousand litres.

The equipment for housing the men in some cases consists of two large tents, each capable of sleeping twenty-four. These are carried on the trailer dragged by the large truck. These tents are not always used, better quarters being frequently found in barns, schoolhouses, etc.

The personal equipment of the men includes a folding canvas cot,

a sleeping bag, and at least two heavy blankets, though in some of the sections the sleeping bag has not been served out.

If a section remains for any length of time in a given sector, the large camion will be used to transport the gasoline supply, disinfectants, etc., while the small camion will haul the daily rations and supplies for the section itself. In very busy times both the large and small trucks can be used to evacuate sitting cases, thus relieving some of the strain on the ambulances themselves.

The above scheme of organization, of which only a rough idea has been given, was arrived at after considerable experimenting, but it now seems to work quite well. The weak points are the French lieutenant who rarely understands the American character, and who sometimes does not even speak English, and the short time of the enlistment of the volunteers themselves; six months. A man just becomes thoroughly trained and really valuable in this period, then he leaves, with the result that considerable energy and time are spent in breaking in new men. This very naturally takes away from the efficiency of the section.

A full section is usually assigned to a division, and is almost invariably quartered in the town in which the headquarters of the division itself are established. The "Médecin Divisionnaire," as the ranking medical officer of a division is called, having organized his sector with the first-aid stations, hospitals, etc., the lieutenant commanding the sanitary section proceeds to organize the transportation. The details and workings of this will be described under another heading.

EARLY EXPERIENCES. SECOND LINE EVACUATION WORK, MONTDIDIER SECTOR

February to June, 1915, found the writer in charge of an American volunteer automobile ambulance corps, composed of several ambulances, and working under the charter of the Hôpital Militaire du Val de Grâce, of Paris. The necessary funds for this corps were furnished by Mr. Herman Harjes, the well-known banker.

During the above-mentioned period the corps was assigned to the Evacuation Hospital of Montdidier, which included all of the hospitals in the town itself, as well as those within a radius of ten kilometers of the town.

The medical officer commanding this sector, or group of hospitals, held the rank of lieutenant colonel, and it was from him that the ambulance corps received its orders.

The organization of this corps was extremely primitive, the personnel being as follows:

OFFICERS

One American in charge of the ambulances with the title of Chef des Ambulances; one French sergeant detailed from the Hôpital Militaire du Val de Grâce, Paris, with the title of Officier de Liasion.

MEN

One cook, salary paid by Mr. Harjes; two mechanics, salary paid by Mr. Harjes; five to seven drivers: All volunteers, the number being never less than five, never more than seven.

Quarters for the corps were provided in the Château of Ayencourt, lent by the owner for this purpose, situated about four kilometers from Montdidier. The ambulances, the salary of the cook and two mechanics, the food, the men's uniforms and equipments, were all furnished by Mr. Harjes. The gasoline, oil and tires were supplied by the French Army, at the order of the lieutenant colonel commanding the Montdidier Evacuation Hospital.

The ambulances themselves were as follows:

2-6 cylinder 38 hp. Packards.....	Body of the old angle iron canvas type.
1-4 cylinder 30 hp. Packard.....	Body of the old angle iron canvas type.
1-4 cylinder 35 hp. Renault.....	Body of the old angle iron canvas type.
2-4 cylinder 24 hp. Panhards.....	Body of the old angle iron canvas type.
1-4 cylinder 35 hp. Panhard.....	Body of the old angle iron canvas type.
1-4 cylinder 12 hp. Motobloc.....	Body of the American Ambulance four stretcher type.
1-4 cylinder 35 hp. Renault.....	Light truck body capable of accommodat- ing six seated patients.
1-4 cylinder 10 hp. Berliet.....	Touring car body, for use of staff.

With the exception of the two six cylinder Packards, and the one 35 hp. Renault ambulance, all of the above cars were old, worn out, and out of date, the three Panhards and the Renault truck being constructed in 1907.

The town of Montdidier, which was at that time about 12 kilometers from the first-line trenches, had been organized as a receiving, distributing, and forwarding center for that part of the line immediately in front of the town, or from slightly south of Andechy to a little south of Beuvraignes, a total front of about 18 kilometers.

The hospital of evacuation itself, which served the commanding medical officer as headquarters, was situated in the railroad depot of the town, and was used simply as a receiving, distributing, and forwarding station. All sick and wounded from this part of the front were brought to this hospital. The system, with its dependent hospitals, was organized as follows:

Hospital of Evacuation.....	In R. R. Station.	Receiving, distributing, forwarding station, headquarters of the commanding medical officer.
City Hospital.....	In Montdidier.	Capital surgical cases.
Jeanne d'Arc Hospital.....	In Montdidier.	Light surgical cases.
Girls' school hospital.....	In Montdidier.	Non-contagious sicknesses.
Public school Hospital.....	In Montdidier.	Contagious sicknesses.
Old College Hospital.....	In Montdidier.	Epidemics, such as typhoid, etc.
Three houses.....	In Montdidier.	Suspected contagious cases kept under observation.

Besides the above, a hospital was established in the school at Breteuil, a town of about 3,500 inhabitants, situated twenty kilometers to the west of Montdidier, but not in direct railroad communication with this latter town. The capacity of this hospital was about three hundred patients, and was used for such slightly wounded and sick as were expected to make a rapid recovery, returning to their regiments without the necessity of a long convalescence at the rear. The evacuations from Montdidier to Breteuil were made by the ambulances of the Harjes Corps.

Furthermore, a sanitary train passed through Montdidier every afternoon between four and five o'clock in the afternoon, coming from Amiens in the direction of Creil, which latter town was the real receiving center of this entire part of the line.

The manner of sending in the sick and wounded from the front to the evacuation hospital was as follows:

(1) Serious cases of wounds or non-contagious cases were rushed in at once to the evacuation hospital, by the automobile ambulances of the division holding that part of the line.

(2) The slightly wounded and sick were sent in by a regular convoy of the divisional automobile ambulances—this convoy arriving at Montdidier every day between two and three p. m.,—thus allowing time for the classification of such cases as would be sent away in the sanitary train of that afternoon.

(3) Contagious cases were handled entirely by the old-fashioned horse-drawn ambulances.

In order to cope with the above, the distributing service of the Harjes corps was organized as follows:

(a) One ambulance was kept continually on service, from 8 a. m. to 9 p. m. at the evacuation hospital. This was worked in three shifts, 8 a. m. to 12.30 p. m., 12.30 p. m. to 6 p. m., and 6 p. m., to 9 p. m., respectively. The duty of this ambulance was to distribute such urgent cases as arrived from the front, to transport to the station such convalescents from the Montdidier hospitals as were being sent to the

rear on the daily sanitary train, and to distribute the sick and wounded arriving in the afternoon convoys.

NOTE:—Seriously wounded arriving at the Evacuation Hospital between 9 p. m. and 8 a. m. were distributed by the divisional ambulance that brought them in.

(b) During the early afternoon, one, two, three, or whatever number of ambulances of the Corps, ordered by the commanding medical officer, would be sent to help number 1 in the afternoon distributions and evacuations. These being completed, these latter ambulances would undertake the evacuation of such cases as were being sent to Breteuil.

Each ambulance, when carrying sick or wounded, was accompanied by a French soldier infirmier, attached to the evacuation hospital. The duty of this attendant was to see that the ambulances were properly loaded, the papers of the patients in order, etc., a duty that was usually performed in the most slovenly manner, the real responsibility in most cases falling on the driver of the ambulance.

The following figures taken from the notebook of the writer will furnish interesting data on this service:

FEBRUARY, 1915		
		<i>Average per car</i>
Ambulances in service.....	7	29.4
Calls answered.....	206	29.4
Patients transported.....	947	135.2
Kilometers run.....	3,755	536.4
MARCH, 1915		
Ambulances in service.....	7	
Calls answered.....	279	39.6
Patients transported.....	936	133.7
Kilometers run.....	5,459	779.8
APRIL, 1915		
Ambulances in service.....	7	
Calls answered.....	351	50.1
Patients transported.....	1,042	148.6
Kilometers run.....	4,417	631.0
MAY, 1915		
Ambulances in service.....	6	
Calls answered.....	384	64.0
Patients transported.....	909	151.5
Kilometers run.....	4,072	678.6

EARLY EXPERIENCES, FRONT WORK

During the month of June, 1915, the French authorities suggested that the Harjes Corps should be increased to fifteen ambulances, and from that time on act as a first-line ambulance section. This was accordingly done, or at least nominally done, as three of the older cars were out of commission and waiting for exchange parts.

This reformed Corps, known as the "Section Sanitaire Harjes," consisted of ten effective ambulances, one light truck with seating capacity for six patients, and a small touring car for inspection work. The section was manned by ten (shortly increased to eighteen) volunteer drivers, one paid mechanic, and a cook. The writer, in command with the title of "Chef de Section," was included in the above number.

The latter part of June, 1915, the S. S. H. was assigned to the X Division, and ordered to Divisional Headquarters, then established in the town of Davenescourt, ten kilometers north of Montdidier.

No attempt having been made to organize the S. S. H. from a French standpoint, the writer will not describe this period of the service, but the following figures will illustrate the possibilities of ten ambulances capably and enthusiastically driven. To make matters more difficult, the transfer of the S. S. H. had deprived the Montdidier hospitals of their ambulances, so that it was found necessary to detach at least two cars each day to attend to this service, thus leaving never more than eight ambulances to take care of the sick and wounded of the entire X Division, at that time one of the strongest in the French Army, having over twenty-eight thousand men in its ranks. During this period, covering two months, no call was kept waiting, and the writer knows of several cases where the wounded man was actually on the operating table in a Montdidier hospital in between thirty-five and forty minutes after being wounded in the trenches.

JULY, 1915

Ambulances in service.....	10
Trips, Montdidier service.....	253
Patients transported, Montdidier service.....	619
Trips, frontal service.....	249
Patients transported, frontal service.....	584
Convalescents returned to regiments.....	60
Kilometers run.....	11,050
Litres of gasoline used.....	4,611

AUGUST, 1915

Ambulances in service.....	10
Trips, Montdidier service.....	377
Patients transported, Montdidier service.....	1,460
Trips, frontal service.....	391
Patients transported, frontal service.....	639
Convalescents returned to regiments.....	142
Kilometers run.....	17,922
Litres of gasoline used.....	5,896

NOTE.—The enormous increase in the Montdidier service during the month of August was due to the fact that the Germans had thrown a number of large shells into the town, and, while little damage had been done, it was thought more prudent to evacuate the Hospitals.

During the month of September the number of cars in the section was increased by the addition of six new Ford ambulances of the American Ambulance three-stretcher type, and an old Peugeot transformed into a truck capable of carrying about one and a half tons. A very finely equipped repair truck was also attached to the section by the French Army.

It was during this time that the process of organizing the section from a French Army standpoint was undertaken. A second lieutenant of the French Army was placed in command, a French sergeant assigned as bookkeeper, etc. But as these changes were not in successful working order until the end of the month, no attempt will be made to describe the operations of the section during this period. The following figures will, however, be found of interest.

SEPTEMBER, 1915

Ambulances in service.....	16
Trips, Montdidier service.....	199
Patients transported, Montdidier service.....	794
Trips, frontal service.....	519
Patients transported, frontal service.....	1,617
Convalescents returned to regiments.....	53
Kilometers run.....	19,492
Litres of gasoline used.....	6,226

NOTE:—The increase in the number of patients transported in the frontal service was owing to an attack being prepared to take place in conjunction with the French Champagne offensive of 1915, and though this attack did not materialize, every man not in "A-1" condition was sent to the rear.

October found the section rechristened "Section Sanitaire Americain No. 5," incorporated into the American Red Cross, and organized on lines to all practical purposes similar to those described in Article No. 2 of this report. Only two really important differences are noticeable. First, the number of ambulances had not yet reached its full complement of twenty-one. Second, only one man, the driver, was assigned to each car, an aide driver not being thought necessary at this time.

A number of ambulances from another source having been attached to the Montdidier Hospital system, the S. S. A. No. 5, from this time on, attended only to the frontal work of the division to which it was assigned, the following being a description of the organization and execution of the work during the month of October, 1915:

The headquarters of the X division had for some time been established at Piennes, a small village seven kilometers east of Montdidier, and, as was customary, the S. S. A. No. 5 was stationed in the same village. The ambulances were parked in the public square close to

the offices of the commanding general, the office of the médecin divisionnaire being also only a short distance away.

The immediate staff of the médecin divisionnaire consisted of a second lieutenant in charge of the office, assisted by several bookkeepers, orderlies, etc.; also a so-called "groupe des brancardiers" or company of stretcher bearers, under the command of a medical officer with the rank of captain. To this company were attached several young doctors or medical students, known as médecins auxiliaires, a dentist and his assistant, an administrative officer, and an "aumonier" or chaplain. The entire force when at full strength numbered 222 officers and men.

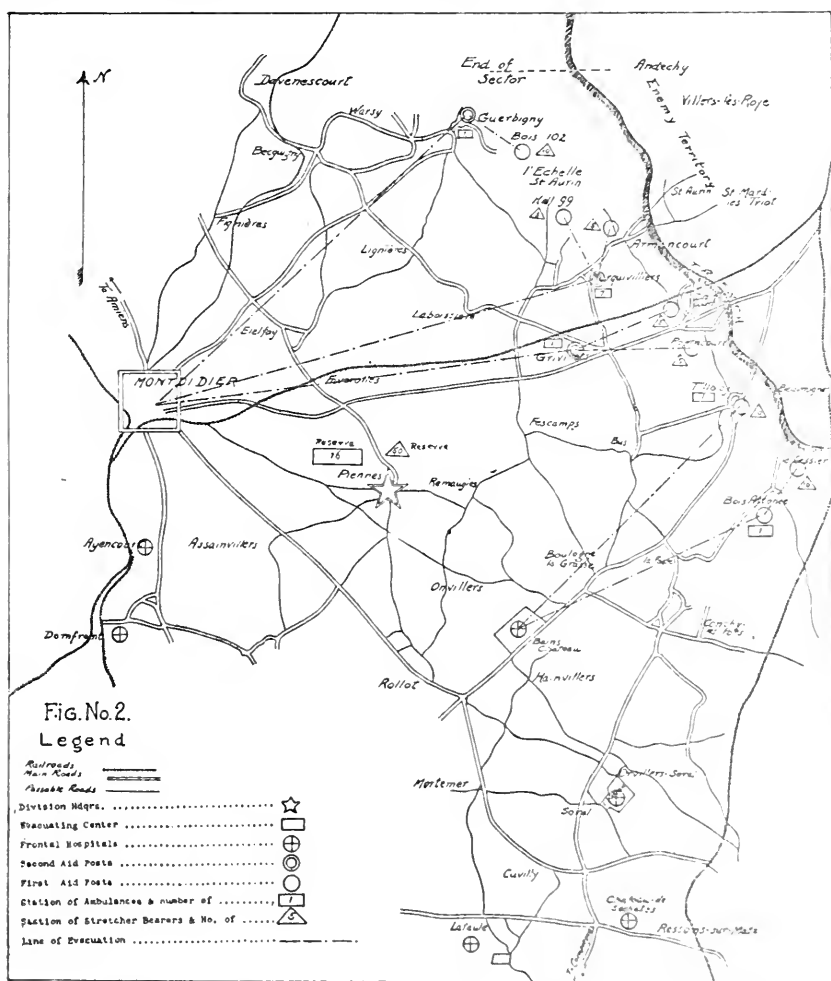
The duties of this "groupe des brancardiers" were somewhat those of a sanitary police for the entire division, attending to such matters as the fumigating of infected houses, etc. They also acted as a reserve force of stretcher bearers that could be sent to any portion of the line especially actively engaged.

Fig. 2 gives a map of the district in which the sector under discussion was situated. The approximate position of the trenches held by the X division was indicated by a shaded line, those of the "premiers postes des secour," or first aide postes, by a circle; the second line aide postes are shown by a double circle; the frontal hospitals, known as ambulances, by a circle containing a cross, division headquarters by a star, and the evacuating center (Montdidier) by a square. The first aid stations at Bois 102 and Hill 99 were not practical for ambulances, the wounded from these posts being brought in by hand-carts; those from Bois 102 were sent to the Post at Guerbigny, and those from hill 99 to Marquevillers. The Posts at Armancourt, Daucourt and Popincourt were only practical for ambulances at night, Armancourt evacuating (by hand) during the day on Marquevillers, Daucourt, and Popincourt on Grivillers.

The frontal hospitals in charge of the medical authorities of the Army corps to which the division belonged were intended to receive only the very lightest cases or very serious non-transportable patients. There were only two of these hospitals in the sector at this time; one situated at Davenescourt to the extreme left, the other at Château Bains, to the extreme right.

During the day, that is to say from eight a. m. to eight p. m., the method of evacuation was as follows: A man or men being wounded, divisional headquarters was at once informed by telephone; details of the number wounded, the nature of the wounds, and to what posts the wounded were being taken, were given. This message was written on a telephone blank and dispatched by a bicyclist to the office of the

médecin divisionnaire. There it would be decided as to whether the case was sufficiently urgent to require the immediate dispatch of an ambulance, also as to whether the patient or patients should be sent to one of the frontal hospitals, or evacuated on Montdidier. The decision made for immediate evacuation, full instructions were written on the



original telephone blank, this being sent by messenger to the office of the S. S. A. No. 5. The lieutenant commanding the section, or, in his absence, the sergeant bookkeeper, would then write out a so-called "order of movement," giving the name of the driver and the number of the ambulance selected for the call by the American "Chef de Section," the route to be followed being also indicated. This order of movement,

in conjunction with the countersign, served as a pass for the driver and ambulance. At the same time, one of the *médecins auxiliaires* would be instructed to accompany the ambulance on the call. The duties of this *médecin auxiliaire* were to see that the papers of the patients were in order, that the ambulance was properly loaded, to take care of the wounded during transportation, and to see that the patients reached their proper destination.

Notwithstanding the above rather complicated process, which usually took from fifteen to twenty minutes, the ambulances frequently reached the first aide postes before the wounded, who were being brought in from the trenches by hand.

Frequently a single ambulance could be used to answer two separate calls at two different posts located in the same part of the sector.

The slightly sick and wounded of the division were evacuated daily by a regular service of four ambulances, each accompanied by a *médecin auxiliaire*, these ambulances leaving the park at Piennes promptly at one p. m. To each of these cars, known as *tournée car* No. 1, No. 2, No. 3, and No. 4, was assigned a separate route obliging it to call at certain postes in the sector, where the slightly sick and wounded of the previous twenty-four hours had been collected from the surrounding district. *Tournée cars* No. 1 and No. 2 evacuated on the frontale, hospital of Château Bains, and the evacuating center of Montdidier, while cars No. 3 and No. 4 evacuated on Davenescourt and Montdidier. Each of these four cars made as many trips as necessary to complete the evacuation from all of the posts for which it was responsible.

Convalescents collected at the evacuation hospital at Montdidier were returned to their regiments by these *tournée cars*, but only if the car was obliged to return empty for more patients, no special trip being taken for this purpose. Otherwise they were obliged to walk, a not very great hardship, as the greatest distance was less than fifteen kilometers.

Contagious cases were treated separately and carried as much as possible in one car, this being carefully fumigated.

During the night, that is to say from eight p. m. to eight a. m., the evacuations were carried on with much less red tape, the *médecin divisionnaire* and the lieutenant commanding the S. S. A. No. 5 being eliminated. Enough "orders of movement" signed in blank to take care of the night service, were given to the American "Chef de Section" who, in turn, left these in the sleeping quarters of the drivers, instructing them as to who was the first man out, and the order of rotation. The call on being received by headquarters would be made out in duplicate, one copy being sent to the sleeping quarters of the "*médecins auxiliaires*,"

the other to that of the ambulance drivers. The driver, on receiving his notification, would fill in a blank "order of movement" to correspond, wake up the man whose turn was next and go to his car, there finding the "médecin auxiliaire" waiting for him. All night evacuations at this period were made on Montdidier. The used and unused "orders of movement" as well as the notifications of the call were turned in to the lieutenant commanding the S. S. A. No. 5 the next morning.

Besides the above-described routine, the dentist and his assistant made their rounds twice a week. The small staff touring car was used for this purpose. The patients requiring treatment would, in the early part of the week, be concentrated in one or two of the larger posts on the right of the sector; in the latter part of the week, in corresponding posts on the left of the sector. Little real dentistry, however, was attempted, the cure for all ills seeming to be the extraction of the tooth.

Notwithstanding the considerable amount of red tape, the organization of the sector as conceived and put into effect by the médecin divisionnaire of the X division, worked smoothly and well. It must be taken into consideration that the period just described was a very quiet one, and, as no emergency orders had been issued, or preparation made to deal with a sudden attack by the enemy, the writer very much doubts if the organization would have stood the test of such a shock.

The following figures give the evacuations, etc., covering this period:

OCTOBER, 1915

Ambulances in service.....	16
Auxiliary cars in service.....	4
Trips, all cars.....	489
Patients transported.....	1,025
Kilometers run, all cars.....	16,346
Litres of gasoline used.....	4,863

During the month of November the X division was moved to the rear to rest, the Y division taking its place in the sector. The S. S. A. No. 5 at the same time was transferred from the X to the Y division, with instructions to continue the work from its old quarters at Piennes.

The arrival of the new médecin divisionnaire was the signal for a general reorganization of the frontal hospital system of the sector; the hospital at Davenescourt to the extreme left being closed, and its place taken by Domfront and Ayencourt, eight and four kilometers (respectively) south of Montdidier. Ayencourt was a small château intended to receive the overflow from Domfront.

To the right of the sector a hospital was opened in the Château Sorel, about six kilometers from the existing hospital at Bains, and intended to receive the overflow from this latter institution.

Furthermore, on the extreme right of the sector two other new hospitals were opened, one in the Château de Séchellés, the other in the Château of Lataule. These two hospitals handled only special cases—Séchellés, head cases, Lataule, eyes and ears, and received patients from both of the divisions forming the army corps.

The actual evacuation of the sick and wounded, under the new "médecin divisionnaire," was carried on in much the same manner as described in a previous part of this chapter, with three slight differences:

First, the "groupe des brancardiers" of the Y division had no "médecin auxiliaire" attached to it, thus throwing the entire responsibility on the ambulance drivers. This also obliged a second driver to act as assistant on all night calls.

Second, an attempt was made to classify all night evacuations by instructing the regimental surgeons as to which of the various frontal hospitals each class of case should be sent. This proved a failure and the cause of endless confusion, as no attempt was made to find out if there was room in the hospital selected, besides which a not infrequent error in the diagnosis would make the class of case unsuitable for that hospital. After several experiences with ambulances, loaded with badly wounded, spending half the night strolling from hospital to hospital, and in the end being obliged to evacuate their patients on Montdidier, a vigorous protest from the writer, requesting the "médecin divisionnaire" to either keep his office open all night, or to return to the system of evacuating all night patients on Montdidier, decided that officer in favor of the Montdidier plan.

Third, lunatics were evacuated on Amiens, 42 kilometers to the west, a permanent state asylum being situated near that town. Special cases of nervous disorders were sent to Compiègne, 35 kilometers to the east. Compiègne was the headquarters of the chief medical officer of the army of which the Y division formed part.

The "médecin divisionnaire" also issued detailed instructions to the "groupe des brancardiers" and ambulances for the handling of the wounded resulting from various forms of attack. Fig. 5 indicates the stations assigned to the ambulances and reserve stretcher bearers in case of an enemy attack by gas.

During the month of November the number of ambulances in the section was increased to twenty-one by the addition of two new cars and the repair of one of the old ones. Only eighteen ambulances were used, however, three being held in reserve.

The following figures represent the number of evacuations, etc., executed by the section during the months of November and December, 1915. It will be noted that the number of kilometers run is out of all

proportion to the number of patients transported. This was due to the fact that considerable training in convoy running, etc., was indulged in.

NOVEMBER, 1915

Ambulances in service.....	18
Auxiliary cars in service.....	4
Total hp. of all cars in service.....	575-523
Patients transported (sitting cases).....	592
Patients transported (stretcher cases).....	62
Convalescents returned to regiments.....	20
Kilometers run.....	16,576
Litres of gasoline used.....	5,484
Trips (all cars).....	404

DECEMBER, 1915

Ambulances in service.....	18
Auxiliary cars in service.....	4
Total hp. of all cars in service.....	573
Patients transported (sitting cases).....	610
Patients transported (stretcher cases).....	69
Convalescents returned to regiments.....	5
Kilometers run.....	18,658
Litres gasoline used.....	5,942
Trips (all cars).....	479

NOTE:—The hp. of cars in service is estimated on the European basis, the Ford cars, as an example, being rated at 14 hp. This will be referred to in the chapter under the heading of "SUGGESTIONS."

EXPERIENCES AT THE BATTLE OF VERDUN, MARCH, 1916

NOTE.—The subject dealt with in this chapter being written from memory, without the use of notes, probably contains a number of slight inaccuracies. In order to avoid the possibility of giving a false impression, the writer has only dealt with conditions and incidents that came under his personal observation.

The latter part of February, 1916, the S. S. A. No. 5 was ordered to the rear to refit and repair the ambulances, many of which, especially among the older cars, were by this time in a deplorable condition. Before any real work could be done in this direction, however, the order was countermanded, the entire section receiving instructions to proceed by road to the Verdun district, a distance of about three hundred kilometers. Delayed by a heavy fall of snow, it was not until three days later that the S. S. A. No. 5 joined its old Army Corps, composed of the X and Y divisions, which had come on by train, as part of the reinforcements to the Verdun Army then feeling the first shock of the Crown Prince's attack.

The Army Corps, concentrated in a number of small villages about 35 kilometers southwest of Verdun, was being held in reserve, so that during this period the work of the S. S. A. No. 5, as well as that of the

other section attached to the corps (one section for each division), consisted of ordinary routine only, such as the evacuation on Bar-le-Duc of the few sick of the corps, the distribution of new gas masks, etc.

During the morning of March 8, the army corps took up its position in the first line; headquarters being established at Dombasle, about eleven kilometers behind the trenches, the S. S. A. No. 5 and its companion section located at Recicourt, headquarters of the X division four kilometers to the west of Dombasle.

Owing to the cancelling of the order to refit and repair, the S. S. A. No. 5 now consisted of sixteen effective ambulances. The personnel was also in a weakened state, only ten trained drivers being available; the rest, including the aid drivers, were new recruits lately arrived from the U. S. A.

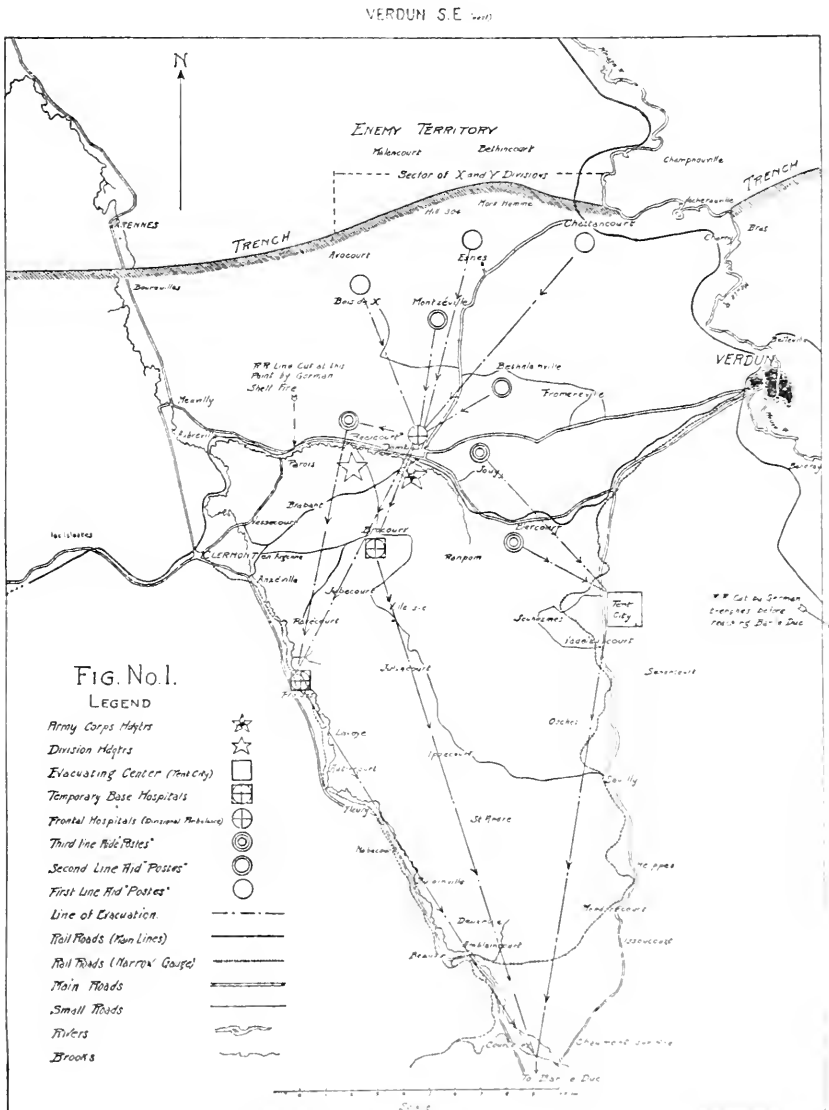
Two places will bear a short description—the distributing center established $2\frac{1}{2}$ kilometers northeast of Las Souhesmes and the temporary base hospital at Vadelaincourt, the first-named as a model of efficiency, the second, on account of the lack of forethought in the arrangement of its entrance and buildings, representing a condition of affairs that should be avoided at all costs.

The distributing center, situated two and one-half kilometers north-east of Las Souhesmes, on the intersection of the road from that town and the road connecting Verdun and Bar-le-Duc, passing through Souilly and Chaumont sur Aire, was known as Souhesmes, though sometimes nicknamed "tent city." As indicated by its nickname, this institution consisted of twelve or fifteen large tents, with quite a formidable number of medical authorities and brancardiers in attendance. A half section of ten British Red Cross ambulances also used this point as headquarters, operating under the orders of the chief medical officer of "tent city." A glance at the map No. 1 will show the central position of this point occupied in the early days of the battle, and situated as it was on the main road from Verdun to the rail head at Bar-le-Duc, offered exceptional facilities for the evacuation of the slightly sick and wounded in the innumerable convoys of automobile trucks running back empty to Bar-le-Duc for supplies.

Up to the middle of the second week in March practically all of the aid posts of the second and third line, as well as the divisional ambulances, evacuated on Souhesmes, that is to say, the posts in the immediate vicinity of Verdun, to the west of Verdun as far as Recicourt, and probably to the east and south of Verdun, though the writer is not positive if this latter statement is correct.

An ambulance or ambulances arriving at "tent city" were at once inspected by one or more of the medical officers of that institution

(the large staff permitting a sufficient number to be assigned to this duty to take care of any probable number of ambulances arriving at the same time). All sitting cases, that is to say the slightly sick and



wounded, were taken out of the ambulances into the tents for classification, the ambulance or ambulances with the remaining serious cases on stretchers being instructed to proceed to the temporary base hospital at Vadelaincourt, three kilometers to the south, or in the event of that

hospital being full, special instructions were given to evacuate on Chaumont sur Aire, a run of twenty kilometers due south.

A large number of very slightly wounded (acting on the instruction of the medical officers of their regiments) also evacuated themselves on foot to "tent city," thus considerably relieving the strain on the various ambulance sections.

A sufficient number of patients having been collected and classified, the commanding officer of Souhesmes evacuated them on the Rail head at Bar-le-Duc by the simple process of stopping one of the passing lines of covered automobile trucks, running back empty to that town for supplies. As each one of these trucks was capable of holding from twenty to thirty men, and as an entire section of twenty of these trucks would frequently be used for a single evacuation, the number of wounded handled by "tent city" in the course of a day must have been enormous.

The writer cannot speak too highly of the efficiency of the organization of this distributing center, for it seemed to make no difference if ambulances arrived by day or by night, singly or in convoy, there was never any congestion, and, moreover, an ambulance was rarely held up more than five minutes.

The temporary base hospital of Vadelaincourt, situated on the southern outskirts of the small town of that name, was composed of a number of large portable wooden houses, arranged in avenues and streets, but so badly conceived was the plan on which these houses were set up, that not only was there but one gate serving both as entrance and exit, but, to make matters worse, the receiving ward was in one of the houses farthest away from this gate, the avenue leading to this ward being so narrow that it was out of the question for two ambulances to pass. Moreover, so restricted was the open space in front of the ward, that it was only with the greatest difficulty that the larger ambulances were able to turn around. Owing to the above arrangement, only one ambulance could enter at a time, and the writer feels convinced that the receiving capacity of this hospital was not more than five to six ambulance loads per hour. As five or six different sections were evacuating their stretcher cases on Vadelaincourt, the congestion was terrific, an ambulance often being obliged to wait in line three or four hours before being able to discharge its load of wounded. Needless to say, many of the most serious cases died in the cars owing to this needless delay.

In the succeeding hospitals of this nature, this fault was remedied, the cars driving in one side and out the other, several ambulances being able to unload at the same time, but it seems inconceivable that the fault should have existed at all.

A full section of twenty British Red Cross ambulances was attached

to this hospital at Vadelaincourt, the transportable cases being evacuated on Bar-le-Duc, about forty-five kilometers by road to the rear.

By noon of the 8th of March, both the S. S. A. No. 5 and its companion section were installed in their new quarters at Recicourt. The X and Y divisions not yet having taken contact with the enemy, it was decided that for the present one of the two sections would be sufficient to attend to the work of the sector for both of these divisions. This duty was accordingly assigned to the companion section, the S. S. A. No. 5 being instructed to hold itself in readiness to assist in the evacuation of the wounded of an adjoining Division, where the pressure was being more heavily felt for the time being.

The service of the sector at this time consisted of the night evacuation of the three first aid posts, at Chattancourt, Esnes, and Bois d'X, none of the three being practical in the day, and all three evacuating on the divisional ambulance at Dombasle. Also the day evacuation of the second line posts at Montzeville, Béthelainville, and the third line posts at Recicourt, Jouy and Blercourt, as well as the evacuation of such cases as could be moved from the divisional ambulance at Dombasle itself, all of these evacuating on "tent city," Vadelaincourt, or Chaumont. (See Fig. 1.)

During the early afternoon of the eighth, the S. S. A. No. 5 received orders to send ten of its available ambulances to evacuate the transportable cases from the ambulance of an adjoining division, situated in a large church at Fromereville, 10 kilometers northeast of Recicourt. This was accordingly done, the ambulances starting almost immediately, the remaining six ambulances of the section being held at Recicourt in reserve.

About 2 a. m. the morning of the ninth the squad operating at Fromereville telephoned for help, and the remaining six ambulances were at once dispatched to their assistance. These latter, on arriving, found conditions more than serious. Firstly, on account of the congestion at the temporary base hospital of Vadelaincourt (referred to in a previous paragraph) the ambulances had only been able to make two trips per car up to that time, or a total of twenty carloads in twelve hours.

Secondly, the hospital at Vadelaincourt was now full, so that all future evacuations of stretcher cases were to be made on Chaumont-sur-Aire, a round trip of seventy-five kilometers from Fromereville, and this over roads congested with all forms of traffic, convoys of motor trucks, artillery, infantry, etc.

Thirdly, other ambulances were bringing in fresh wounded from the

front faster than they were being evacuated by the cars of the S. S. A. No. 5.

Fourthly, the French had planted a perfect nest of batteries of all calibers just outside of the town, and a terrific artillery duel being in progress, it became evident that the ambulance itself would have to be evacuated and abandoned as soon as possible, for though the church in which it was established had not up to this time been hit, the German shells were falling fast and had caused quite a number of casualties in the town.

The S. S. A. No. 5 set to work with a will, but it was not until 6 a. m. the morning of the tenth that the ambulances were able to return to their quarters at Recicourt, the operation completely terminated. About seventy loads of wounded in all were evacuated from Fromereville, some of the drivers and cars having been on duty for forty consecutive hours, during which time the ambulances were run on their reserve supply of gasoline, the drivers living on the two days' emergency rations always carried in each car. On returning to quarters, the personnel was ordered to take six hours of sleep and report for duty at noon.

During the night of the eighth and ninth, and the ninth and tenth, the X and Y divisions were in contact with the enemy, with the result that the companion section had been unable to attend to anything but the absolute frontal work, leaving a twenty-four hours accumulation in the rear posts of Recicourt, Jouy, and Blercourt. This the S. S. A. No. 5 was instructed to clean up, these instructions being carried out, and the work terminated in the early hours of the morning of the eleventh.

By noon of the eleventh, orders were received that changed the entire scheme of operating.

Firstly, "Tent City," Vadelaincourt and Chaumont were no longer to be used by the X and Y divisions as an evacuating center, their place being taken by two new temporary base hospitals opened at Brocourt and Froidos (See Fig. 1). Evacuation of stretcher cases from all of the posts of the first and second line (Chattancourt, Esnes, Bois d'X—, Montzeville, Béthelainville) to be made on the divisional ambulance at Dombasle, or when this institution was full on the temporary base hospital at Brocourt. All sitting cases were to be taken to the post at Recicourt. The divisional ambulance at Dombasle and the post at Recicourt evacuated their transportable cases on the temporary base hospital at Froidos. Both Brocourt and Froidos evacuating on Barle-Duc, a full section of ambulances being stationed at Froidos for this purpose. The third line posts at Jouy and Blercourt were no longer in the sector of the X and Y divisions.

Secondly, it was decided that from this time on the S. S. A. No. 5 and its companion section were to share both the front and rear work, the shifts being arranged in somewhat the following manner:

6 P. M. (dark) to Midnight. C. S. Evacuation of frontal posts of Chattancourt, Esnes and the Bois de X.

Midnight to 6 A. M. (dawn) S. S. A. No. 5. Evacuation of frontal posts of Chattancourt, Esnes and the Bois de X.

6 A. M. to Noon. C. S. Evacuation of second and third line posts of—Montzeville, Béthelainville, Dombasle and Recicourt.

Noon to 6 P. M. (dark) S. S. A. No. 5. Evacuation of second and third line posts of—Montzeville, Béthelainville, Dombasle and Recicourt.

NOTE.—Both morning and afternoon shifts if not too busy were liable to be called on to assist in the evacuation of the third line posts of Jouy and Blercourt, now in the sector of an adjoining division. Both of these posts received only sitting cases and evacuated on "Tent City."

The order of rotation of the two sections could be changed if found advisable, by the simple method of skipping the 6 a. m. to noon shift. This service was never of much importance, as the time between these hours was usually employed by the doctors in the various posts in classifying the patients received during the night. This, however, was never done, the work as scheduled above seeming to balance itself with great fairness, for while the S. S. A. No. 5, with the noon to 6 p. m. shift, would often be on service until 10 or 11 p. m. before being able to clear all of the posts assigned to it, on the other hand the C. S. would frequently succeed in evacuating all of the frontal posts before midnight, in which case the S. S. A. No. 5 would be obliged to send out only a few cars if any at all.

The following description of the night evacuation of the first aide post at Chattancourt, is cited as being a fair example of this class of work, this particular night being selected on account of its being the first in which the S. S. A. No. 5 participated, and for this reason the details seem to be more firmly fixed in the mind of the writer.

Shortly before midnight of March 11-12, the orders for the midnight to 6 a. m. shift were received at the quarters of the S. S. A. No. 5 these in effect were as follows:

(1) Two ambulances to be stationed at the Bois de X. These to evacuate stretcher cases on Brocourt, sitting cases on Recicourt.

NOTE.—The post of Bois de X being on the extreme left of the line held by the X and Y divisions was never of much importance, and rarely required more than two cars in attendance.

(2) The pressure on the line in front of Esnes had not been severe, and that post was already cleared of wounded, the S. S. A. No. 5 were therefore instructed to continue the work of the companion section in the evacuation of the post at Chattancourt, where there still remained quite a large number of badly wounded who must be evacuated before dawn, as the road leading to that town was in plain sight of the German lines. All stretcher cases to be evacuated on Brocourt, sitting cases to Recicourt. *No Lights To Be Used.*

NOTE.—From this time on no lights were used anywhere in the sector, except on a very few of the more sheltered roads well to the rear.

At midnight, as ordered, two cars were dispatched to the Bois de X, the remaining effective cars of the section, twelve in number, taking up their position in the main street of Montzéville five kilometers from Chattancourt. The cars were drawn up in Indian file, 100 meters between each car, in order that not more than one car could be destroyed by a single shell. The night was very cold with about one centimeter of frozen snow covering the ground, and though this made it much easier to follow the road in the dark, it was feared that the ambulances would be seen by the enemy when crossing the open road leading to Chattancourt.

Fourteen freshly wounded were found in the post at Montzeville, and two ambulances were detailed to evacuate these on Brocourt, with instructions to rejoin the section as soon as possible.

About 12.45 the last ambulance of the companion section came out from Chattancourt with a full load of badly wounded. The driver of this car reported that the road leading to Chattancourt and the town of Chattancourt itself were being very heavily bombarded, a statement easily believed as the shells were now falling close to the position occupied by the S. S. A. No. 5 in Montzeville.

On receiving the above information, two ambulances were at once dispatched to Chattancourt, two others following in twenty minutes, and two more after another interval of twenty minutes, etc., these cars discharging their wounded at Brocourt or Recicourt, as the case might be, and returning to the station at Montzeville as rapidly as possible. And so, at the rate of six carloads an hour, the work of evacuation was carried on for the remainder of the night, the last of the wounded being successfully brought in just as dawn was breaking. Twenty-four ambulance loads, almost all stretcher cases, being evacuated by the S. S. A. No. 5 alone.

Considering the intensity of the bombardment, the casualties were remarkably light. One unfortunate brancardier had his legs blown off while loading an ambulance. One ambulance was slightly damaged by a shrapnel ball, and a second ambulance (fortunately empty), having fallen into a shell crater, was abandoned, but rescued undamaged the next night.

From this time on, the work in the sector continued in much the same manner, and should need no further description. One point, however, is of interest, and that is the length of time a sanitary section can work under the strain of a great battle, without being sent to the rear to rest the personnel and repair the cars. The writer trusts the following paragraphs will shed some light on this subject.

The companion section to the S. S. A. No. 5, having had the mis-

fortune to lose two or three cars and one or two men by shell fire, was commencing to show a certain amount of demoralization, and was accordingly ordered to the rear on the fifteenth of March, having been in action but seven days. Of these seven days, however, the section had done the entire frontal work for two full divisions for four days, and one half of the frontal as well as one half of the rear work for the same divisions for the remaining three days.

On the nineteenth of March, the S. S. A. No. 5, having only ten effective ambulances left, with a personnel so exhausted by overwork that the entire unit was practically worthless, were ordered to the rear, having been in action eleven days. During four of these eleven days, the section executed all of the rear evacuations for two full divisions as well as part of the rear evacuations for a third division. For the remaining seven days, this same section attended to one half of the front and one half of the rear work for two divisions.

Both of the sections relieving the S. S. A. No. 5 and its companion section, remained in the sector two full weeks; the writer having the opportunity to inspect one of these sections on its arrival at the rear, found it in almost perfect condition and quite ready to return to the front after the personnel had been allowed a much needed rest of a week or ten days. It must be said, however, that both of these relieving sections worked in an organized sector, and did not have the trying experiences of the first days of the battle, with its unavoidable confusion and lack of organization.

Taking everything into consideration, the writer sees no reason why a well equipped and thoroughly disciplined section should not be relied upon to continue its service in the battle line (even under the most trying conditions) for at least two full weeks.

The following translation of a General Order of the X Army, published under date of April 3, 1916, may be found of interest.

GENERAL ORDER No. 83

The General commanding the X Army mentions in dispatches of that Army.

THE SECTION SANITAIRE AMERICAINE No. 5. (Harjes)

During a period of eleven days of combat, from the eighth to the nineteenth of March, did the work of evacuation over a zone particularly violently bombarded by the enemy's artillery, displaying an absolute contempt for danger. Furthermore, the personnel gave proof of a remarkable endurance and devotion, in assuring the maximum of efficiency of this unit by serving an average of nineteen hours a day.

(Signed)

PETAIN;

The General Commanding the X Army.

SUGGESTIONS

NOTE.—The opinions expressed in this chapter are simply those of

the writer, and should be regarded in that light only. The writer, however, feels convinced that his views on this subject are of value. Not only owing to the fact that he has been connected with the Automobile industry both in Europe and the United States for the last seventeen years, but also having toured extensively on the Continent and at home, he is familiar with conditions on both sides of the Atlantic. This, combined with nineteen months experience in the Ambulance service with the French Army, should, he believes, entitle his views to carry a certain amount of weight.

THE CHASSIS

In selecting the type and make of chassis to be used in the formation of an Ambulance Section, that is to say the chassis for the Ambulances themselves, as well as the chassis for the auxiliary cars, such as the Kitchen truck, the Repair truck, the Officers' staff car, etc., the following general points should be kept in mind.

- (1) The nature of the country the Section is to operate in.
- (2) Only the highest grade of construction and material should be considered.
- (3) Standardization combined with simplicity and a reasonable amount of lightness.
- (4) As great an amount of clearance as possible without interfering with the stability of the car.

In Europe it has been demonstrated that a motor developing from 12 to 15 hp. (European rating) will furnish ample power for a frontal Ambulance fitted with a Kellner 5 stretcher body. That is to say, if a 4 cylinder engine be used, each cylinder would have a bore and stroke approximating Bore 80mm. Stroke 120mm. The conditions in the United States, however, being quite different, on account of the bad roads and the generally more difficult nature of the country, an engine of this size would hardly give enough power to handle a chassis fitted with so heavy a proposition as a Kellner 5 stretcher ambulance body.

In the opinion of the writer, the problem resolves itself into two distinct parts:

A. The medium powered five stretcher Ambulance, type Kellner (for service in the middle and eastern states).

B. The light three stretcher Ambulance, American Ambulance type (for service in Mexico and the Western States).

Both types present advantages and disadvantages peculiar to each. The five stretcher ambulance with its greater carrying capacity, not infrequently finds itself in difficulties in country the lighter three

stretcher car negotiates with ease. The light three stretcher car on the other hand is obliged to make practically two trips to every one of the larger ambulance. A very important consideration when a great number of wounded must be evacuated in a given time.

A. Chassis for the Medium Powered Five Stretcher Ambulances. Type Kellner (For service in the Middle and Eastern States).

A 4 or 6 cylinder gasoline engine (of the pocket valve type in preference to the "Sleeve" or so called silent Knight type) will supply the required power for the type of ambulance under discussion, the Bore and Stroke of each cylinder being approximately as follows:

18/20 hp. 4 Cylinder Engine.....	Bore.....	95mm	} Or their equivalent.
18/20 hp. 4 Cylinder Engine.....	Stroke.....	140mm	
	Bore.....	80mm	
18/20 hp. 6 Cylinder Engine	Stroke.....	120mm	

The writer prefers the 4 cylinder type on account of its greater simplicity.

All 4 or 6 cylinders should be moulded in a single casting, this method possessing the double advantage of producing a much more compact engine as well as considerably simplifying the water connections, and in this way lessening the chances of water leaks, due to broken pipes or faulty gaskets.

The valve springs and valve stems should be enclosed in a metal housing easily removed.

In small or medium sized engines of this nature, the gravity, or thermo-siphon system of water circulation may be used with success. The writer, however, very much prefers the system in which a pump is employed, this latter giving better results in hot climates or hilly country.

The oiling system commanded by a pump situated in the motor base may be either of the "splash" at constant level or of the forced feed type.

The carburateur, practically all types of which are now automatic, should be fitted with a needle valve adjustment to the jet. Frequently, excellent results may be obtained from a so-called auxiliary air inlet. This, in principle, consists of a flexible metal tubing running from the intake pipe to a position sufficiently convenient to the driver's hand, where, by means of a device he can weaken the mixture passing from the carburateur to the explosion chamber, by allowing a supplementary amount of air to enter. At certain engine speeds an intelligent driver can effect a considerable saving in gasoline by this means.

The most convenient place for the gasoline tank on chassis of this type is the dash board. This tank should have a capacity of at least 60 litres. Estimating the consumption of gasoline in a service of the

nature of ambulance work at one half of a litre per hour per hp. (European rating), the tank would then contain sufficient fuel to enable a 20 hp. car to execute a non-stop run of at least 6 hours. A tank in this position, besides assuring an excellent flow to the carburateur, relieves the space under the driver's seat, which can then be used for storage or lockers. Under no circumstances should the tank be swung under the rear of the frame, as is customary in many makes of touring cars, for not only is it too apt to be hit by road obstructions in that position, but, on account of the overhang of the body, it cannot be filled without unloading the patient in the lower stretcher, should there happen to be one.

By using the rough formula quoted above (One half of a litre per hour per hp) the following is obtained:

NOTE.—At this point the writer wishes to call attention to the economy in gasoline consumption (or its equivalent, gain in running time) effected by employing small or medium powered engines; the saving of even a few hp. per car giving a total result for an entire unit which is well worth considering. Referring to the table given on page 20 of this report, it will be noted that the S. S. A. No. 5 having 18 ambulances and 4 auxiliary cars in service, with a total hp. of 523 (average hp. 23.8) consumed during the month of November 1915, 5484 litres of gasoline.

$$5484 \div \frac{523}{2} = \left\{ \begin{array}{l} \text{The approximate number of hours run by the section as a unit,} \\ \text{or the average number of hours run by each car.} \end{array} \right\} = 20.9$$

If on the other hand an equal number of cars, of slightly smaller engine power per car, be taken into consideration, and it be assumed that the same amount of gasoline has been consumed, that is to say—

Number of cars 22. Hp. per car 20. Total hp. of the unit 440. Total amount of gasoline consumed, 5,484 litres. The result arrived at is.

$$5484 \div \frac{440}{2} = \left\{ \begin{array}{l} \text{The approximate number of hours run by the section as a unit,} \\ \text{or the average number of hours run by each car.} \end{array} \right\} = 24.9$$

Or, with only the small difference of 3.8 hp. per car, the latter example has a running time of 19.1 per cent, more than the former.

The most advantageous form of power plant for this rough work is of the "block motor" type, meaning by this, one in which the motor and the gear box are in one mass, the fly wheel and the clutch being encased in a casting connecting the motor base and the gear box itself.

NOTE.—This point is of great importance, the fly-wheel being thus protected, should the car meet with one of the too frequent accidents of the front, such as falling into a shell crater, running over a dead horse or log, etc.

The suspension of the "block motor" or power plant should be of the three point type. This method allows the frame to work slightly, when running over very uneven ground, thus minimizing the risk of breaking the supporting arms of the motor, or throwing the motor itself out of alignment.

The gear box should contain four speeds forward and one reverse, the control of these being on the "selective" principle, and the transmission to the rear wheels should be by shaft and "live axle."

The steering column should be set as near the perpendicular as practical, that is to say at an angle of between 52° and 55° in reference to the frame. This arrangement allows the ambulance body to be placed as far forward as possible.

To still further reduce this overhang the chassis should have a long wheel base, about 3m50 being the limit for the size and power of car under discussion. This would leave approximately 2m80 from the dashboard to the end of the frame on which to place the body. Allowing about 1m10 for the driver's compartment and 2m30 for the ambulance body proper, the overhang would then be m.60, a not too serious proposition.

Good brakes are most important, the usual equipment consisting of a running brake operated by a foot pedal, and an emergency brake controlled by a hand lever. In many cars both of these brakes work on drums on the rear wheels, one attacking the drum on the outside, the other on the inside. This system has the advantage of throwing no undue strain on the driving mechanism of the chassis, but to counterbalance this there are two decided disadvantages. In the first place, these brakes do not compensate on corners, both rear wheels being apt to lock at the same time in which case a disagreeable and perhaps dangerous "skid" is experienced. Besides this, oil frequently leaks out of the "live axle" on to the brake drums and shoes, seriously interfering with their efficiency. Another practice adopted is to place the running brake on the shaft, this brake operating on the rear wheels through the differential, and though throwing a considerable strain on that organ, this latter system is much more efficient than when placed with the emergency brake on the rear wheels.

The spring suspension of a frontal ambulance presents a difficult problem, requiring springs sufficiently flexible to ride easily with a light load of one badly wounded man on a stretcher, or to have the necessary strength and stiffness to support a full load of eight patients. As good a solution as any for this most vexing question, consists of a semi-elliptical spring fastening the front axle to the frame, while a second and much longer spring of the same type, its forward end attached to the frame, its rear extremity connecting with a one-half inverted semi-elliptical spring forming a continuation of the frame, acts as the rear suspension of the car. Shock absorbers are a necessity.

Should the chassis be equipped with wooden wheels, it is advisable

to have these fitted with demountable rims, allowing one or preferably two exchange rims mounted with tires to be carried on each car. Owing to the tendency of wooden wheels to dry out in hot climates, or in parts of the country where water is not easily obtainable, the writer is in favor of demountable metal wheels, each ambulance carrying one or two exchange wheels fitted with extra tires. These metal wheels are made in three types.

(1) The metallic detachable wheel, the spokes of which are constructed on the principle of those of a bicycle, the wheel itself slipping on over and fastening to a specially grooved hub, which hub in turn is fitted on to the ordinary hub of the chassis. Of all three types of metal wheels, the writer believes this type to be the least suitable for ambulance work, for not only have the spokes a tendency to snap off, but the wheel itself is extremely difficult to clean.

(2) The Sankey type demountable pressed steel wheel, which, as its name indicates, is constructed of pressed steel, in appearance resembles a wooden wheel. This wheel slips into grooves on the hub of the car, and is held firmly in place by 5 bolts projecting from a back plate on the hub, the nuts of these bolts being easily removed by the aid of a special bit, the mounting and demounting requiring but a very few minutes. This wheel gives excellent results for single tires.

(3) The third form of metal wheel (also demountable), and that recommended by the writer for this class of service, consists of one piece of thin pressed steel curving outwards and very much resembling a saucer. This is mounted on the hub in much the same manner as the Sankey type wheel described above, but has the very great advantage over this former of serving for either single or double tires. The double tire effect is obtained by mounting two of these wheels back to back on the same hub, the concave side of the inside wheel being towards the chassis, and that of the outside wheel away from it.

Tires of the dimensions 895×135 mm. are, in the opinion of the writer, the extreme limit in size that can be successfully employed on these medium-powered chassis, without causing too much of a drag on the motor and transmission. If this size of tire is used, it will not be practicable to have double tires on the rear wheels, the section 135 mm. being too large. Instead the dimension 880×120 mm. would have to be substituted, this latter dimension fitting the same rim as the 895×135 mm. tire. The writer, however, is not in favor of double tires on these medium powered ambulances, considering that they are of advantage only on very heavy and powerful cars or on light trucks.

Electric lighting is practically a necessity for this service, and should be fitted with accumulators "floated" in on the line between the dynamo

and the lamps, in order that a steady light may be obtained when the motor is turning slowly or is at rest.

An 18-20 hp. (European rating) chassis equipped as suggested in the preceding paragraphs of this chapter would weigh in the neighborhood of 1200 Kg. The weight of the ambulance complete and loaded to full capacity, being approximately as follows:

18/20 hp. Chassis (fully equipped).....	1,200 Kg.
Ambulance body, type Kellner.....	700 Kg.
8 patients at 75 Kg.....	600 Kg.
1 Driver and 1 Aide Driver at 75 Kg.....	150 Kg.

Total weight with full load, approximately..... 2,600 Kg.

As the maximum speed that a 18-20 hp. (European rating) car could develop with this load on a level road would be approximately 60 kilometers per hour, it stands to reason that the transmission of the chassis in question must be considerably demultiplied in order that the power plant might meet the demands made upon it. A gear ratio which would give a maximum speed of 60 kilometers per hour when running without patients and only the driver and his aide in the car would be about correct.

CHASSIS FOR THE AUXILIARY CARS

For the officers' staff car the most rational arrangement would be to continue the standardization of the section by employing the same type of chassis as that selected for the ambulance, a light 4-seated touring body taking the place of the ambulance body, and only two slight modifications to the chassis being desirable. Firstly, the steering column should be sloped to a greater angle. Secondly, the gear ratio should be much higher. The chassis equipment with the light body would be capable of a much greater speed than the heavier ambulances.

For the truck squad, that is to say the kitchen and repair trucks, the large truck for transporting the spare stretchers, equipment and supplies, and the small truck or camionnette, the writer is of the opinion that it would be well to standardize this also, using the same power plant selected for the ambulances, only mounted on a light truck chassis, capable of carrying a load of about one and one half tons; these truck chassis to be equipped with pneumatic tires, single on the front wheels, double on the rear wheels, dimensions 880×120mm. (which size it will be remembered also fits the rims selected for the ambulances). The squad would then consist of 5 units instead of 4, two of these light trucks replacing the heavy truck, and one the camionnette. Each one of these units would be quite capable of dragging a

light 2-wheeled trailer, mounted on pneumatic tires of the same dimensions as those on the trucks themselves. The trailers are intended for bulky but not heavy baggage. These trucks should be geared to a maximum speed of 45 kilometers per hour on the level.

The kitchen and repair truck being naturally immobilized at the quarters of the section, the 3 other trucks besides performing their real duties of transporting supplies, etc., for the section could be employed to great advantage for the evacuation of sitting patients whenever there happened to be a great number of these to be moved, each truck having a capacity of at least 16 persons without overcrowding, or a total capacity for the three equal to slightly more than that of six ambulances.

B. CHASSIS FOR THE LIGHT THREE STRETCHER AMBULANCES—TYPE AMERICAN AMBULANCE

(For service in Mexico and the Western States)

The suggestions made in the preceding paragraphs, for medium-powered chassis fitted with the Kellner type ambulance, apply in principle to the light chassis mounting the American Ambulance three stretcher type, with the exception of the following modifications.

- (1) Power of the engine.
- (2) Capacity of the gasoline tank.
- (3) Wheel base of the chassis.
- (4) Dimensions of the tires.
- (5) Weight of the chassis and ambulance complete.
- (6) Gear ratio of the chassis.
- (7) Carrying capacity and gear ratio of the trucks.

(1) A 12 hp. 4 cylinder motor of the type referred to under heading A will be the most advantageous size of engine for the requirements of this service. The bore and stroke of the motor approximating:

12 hp. 4 cylinder engine.....	Bore..... 80mm	} Or their equivalent.
	Stroke..... 120mm.	

NOTE.—For so small a power the 6-cylinder motor should not be considered, the parts becoming too delicate for the practical purposes of this service.

(2) The gasoline tank with a capacity of at least 35 litres, will furnish sufficient fuel to allow this type of light ambulance a radius of action corresponding to 6 hours running time.

NOTE.—In a previous note contained in a preceding paragraph, under the heading A, the approximate number of hours running time for 22 cars of a medium-powered section, was estimated at 24.9 hours, assuming a total consumption of

gasoline of 5,484 litres. Again applying the "one litre per hour per hp." principle, the following conclusion is reached:

Number of cars, 22. Hp. per car, 12. Total hp., 264. Total amount of gasoline consumed, 5,484 litres.

$$5484 \div \frac{264}{2} = \left\{ \begin{array}{l} \text{The approximate number of hours run by the section as a unit,} \\ \text{or the average number of hours run by each car.} \end{array} \right\} = 41.5$$

Or with a diminution of 8 hp. per car, 22 cars of the light section would have a running time 66.6 per cent greater than the same number of cars of a medium powered section, the consumption of gasoline being equal.

The carrying capacity of the medium powered section over that of the light section being greater by 100 per cent for sitting patients and 40 per cent for stretcher cases, an average of 70 per cent and the running time efficiency, on a given amount of gasoline, of the light section amounting to 66.6 per cent more than that of the former—it would seem to be apparent that the medium powered section possesses only a slight advantage. In practice, however, this is not the case. The transportation of wounded not being a commercial proposition, there are other elements besides strict economy to be taken into consideration, desirable as this latter may be—time or its equivalent, the number of trips each ambulance must make in order to evacuate a given number of patients, being one of the chief factors. In this respect, the medium powered car possesses an only too evident advantage.

(3) On these light chassis it would not be practical to use as long a wheel base as that suggested for the medium power cars, a distance of 3m15 being ample. This will leave approximately 2m50 of the frame free for the body. The dimensions of the American ambulance three stretcher type body, being 2m for the interior and about 1m10 for the driver's compartment, the resulting projection of the body over the rear end of the frame would be in the neighborhood of m60, which, when compared with the 1m10 overhang of the same body when placed on a Ford chassis shows a very considerable improvement.

(4) Tires of the dimensions of 880×120mm will, in the opinion of the writer, give the best results, and, as a matter of fact are the largest size which could be used with prudence on the type of chassis under discussion.

(5) A 12 hp. (European rating) chassis, fully equipped as understood from the preceding suggestions, and mounting an American Ambulance three stretcher type body, would weigh under a full load approximately as follows:

12 hp. chassis fully equipped.....	1,000 Kg.
Ambulance body, type American Ambulance, three stretcher cases, or four seated patients.....	300 Kg.
4 patients at 75 Kg.....	300 Kg.
1 driver and 1 aide driver at 75 Kg.....	150 Kg.
<hr/>	
Total weight with full load, approximately.....	1,750 Kg.

(6) The maximum speed of a 12 hp. (European rating) car, weighing 1750 Kg., including full equipment and load, would approximate 55 kilometers per hour on level roads. The gear ratio, therefore, for this type of chassis, when used for an ambulance, should be such as to give it a maximum speed of 55 Kilometers per hour, even when running without patients.

(7) Owing to the reduction in the power of the motor, from 18/20 hp. to 12 hp., the carrying capacity of the truck squad would have to be considerably lessened, falling from 1500 Kg. per unit to 1,000 Kg. per unit, and the gear ratio lowered from one giving a maximum speed of 45 Kilometers per hour on level roads to one whose maximum speed would be 35 Kilometers an hour under the same conditions.

NOTE.—Except for the kitchen truck, whose load would naturally remain the same as in that of the moderate powered section, this reduction in carrying capacity would not be a serious consideration. The smaller engines and lighter parts considerably lessen the weight of the material carried in the repair truck, while the lessened consumption of fuel would not require so large a quantity to be kept on hand in the supply trucks.

EQUIPMENT OF THE AMBULANCES

Besides the ordinary equipment of tools, jack, pump, and a few of the more necessary exchange parts, such as spare valves, valve springs, etc., usually carried in all cars, each ambulance should always be provided with two new spark plugs, exchange electric light globes, two *new* exchange tires and four inner tubes in good condition, a set of "Weed Chains," a very liberal supply of reserve gasoline and oil and a can of grease, a fire extinguisher, a barn lantern, a canvas bucket, brushes and sponges for washing the car, an electric torch, and two days' full rations for the driver and his aide. The full complement of stretchers should also always be carried.

NOTE.—Under no circumstances should any of the equipment of the car, or the personal baggage of the driver and his aide, with exception of the stretchers, be carried in the ambulance body proper, the interior being always kept in readiness to receive its full load of wounded. All equipment and personal baggage should be stored away in the large cases placed on the running boards for that purpose.

EQUIPMENT OF THE KITCHEN TRUCK

The kitchen truck, as its name implies, is a kitchen pure and simple. The equipment, besides the necessary exchange parts, tires, etc., similar to those of the ambulances, consisting of a stove, cooking utensils, and the mess service of the section. A number of long boards and wooden horses, serving as benches and table for the mess, will be found a great convenience. These, however, would be carried in the supply trucks. Only one other point occurs to the writer in regard to this unit and that is that it might be an excellent idea to have the gasoline tank placed on the chassis in such a manner that it could be easily removed, thus lessening the chance of conflagration while cooking is in progress.

EQUIPMENT OF THE REPAIR TRUCK

The repair truck will naturally carry its extra tires, etc. The remainder of the equipment to consist of a bench, a vise, a portable forge, soldering lamps and irons, a vulcanizer for repairing inner tubes, all necessary tools, a carpenter's outfit, nuts, bolts, wire, etc., and a full list of exchange parts for the cars of the section; the above to be supplemented by a pick, shovel, ax and hatchet, a chain hoist, a tow rope, and several powerful jacks. An excellent idea is to have the equipment include a large piece of canvas tenting the full length of the body of the truck. This can be stretched from the roof of the car to two tent poles, forming a shelter for the mechanics to work under.

EQUIPMENT OF THE SUPPLY TRUCKS

The supply trucks, being intended simply for the transportation of the reserve supplies and camp outfit of the section, or, in case of emergency, the evacuation of sitting patients, will have no equipment other than the spare parts (tires, etc.) similar to those carried by the rest of the cars of the section, excepting that each unit should be provided with four stout boards serving as seats for the patients, the width of the body being sufficient to give a seating capacity of four abreast.

EQUIPMENT OF THE PERSONNEL AND CAMP OUTFIT

Both the equipment of the personnel and the camp outfit, depending as they do so largely on the nature of the country and the section it is intended to operate in, will be dismissed by the writer with one or two slight observations:

(1) The writer's experience with large tents, capable of sleeping 24 men, has not been an extremely fortunate one, for not only are they very heavy, but require a good deal of time and patience to pitch. A

greater number of smaller tents is, in his opinion, a more satisfactory solution of this question.

(2) The practice of allowing the personnel of a section to sleep in the ambulances should not be tolerated—disastrous results to their health being only too apt to follow, especially when under the pressure of a great battle the exhausted condition of the drivers and their aides, makes a certain amount of carelessness in disinfecting the cars unavoidable.

(3) The writer hardly believes it necessary to call attention to the fact that every section should be provided with some good disinfecting apparatus, the most convenient of these being in the form of a spray. A frame for washing the stretchers will also be found of great assistance.

RESERVE SUPPLIES

A liberal supply of reserve gasoline and oil, as well as a number of extra stretchers, should always be kept on hand, the transportation of this material being very naturally assigned to the supply trucks when the section is changing quarters.

The reserve quantity of gasoline should equal at least the total capacity of the tanks of the section, with oil in proportion of one to ten. For a medium powered section, consisting of 21 ambulances, 1 staff car and a truck squad of five units, the necessary reserve supply of gasoline would be in the neighborhood of 1,650 litres, with 165 litres of oil. For a light section, 1,000 litres of gasoline and 100 litres of oil.

In conclusion, the writer again desires to call attention to the fact that the above suggestions are simply the expression of his own opinions and should be regarded in that light only.



BEING A MILITARY OBSERVER¹

BY COLONEL JAMES ROBB CHURCH

Medical Corps, U. S. Army

THE average man who carries a watch is vaguely conscious of the fact that somewhere in its amazing interior there is a mainspring and that the functioning of his timepiece is very much dependent on it. As to the original genesis of this fraction of the mechanism he is altogether hazy. He will readily grant that it is of fine steel, but of the many processes and the patient labor which converted the crude ore into the finished product he must confess a fairly complete ignorance.

In the matter of making war, that disagreeable business which becomes epidemic ever so often in this earthly sphere of ours, there are many mainsprings which do function smoothly and about which there is quite as much frank ignorance as exists in respect to the motive power of our timepieces.

Not only the pothouse politicians, but many of us who consider that we are quite sane and logical, talk, and have talked, learnedly and unlearnedly, on the subject of "preparedness." In our late struggle with our persistent Germanic enemies preparedness came to be almost a national word, and he was a man of little invention who did not have in his head and on his tongue's end the full total of our shortcomings in this respect, and who was not prepared with a remedy for it quite as infallible as those which glare impudently at us from the public prints for the abolition of the ills to which human flesh is heir.

If we get down to real bedrock and do not start our foundation on shifting sand, "preparedness" is *not* comprised in any single idea nor in any one form of procedure.

It is, after all, a very complex whole and its listing cannot satisfactorily cease with Plattsburg Camps, militia increases, nor added armaments. It is very truly a condition and not a theory, and it occurs to me that the better comprehension of it is a realization of the value of attention to details.

I am by no manner of means enough of a statesman nor sufficiently well versed in world politics to attempt to deal with the matter as a concrete proposition, but I should like to say a word for a part of this mechanism which functioned very inconspicuously under many difficulties, and which had to be satisfied with official recognition rather than any measure of public acclaim. I refer to that class of duty which falls to those who are denominated as "military observers."

¹ Address delivered before the Book and Journal Club, Baltimore, Md., January 13, 1921, and printed by courtesy of the *Bulletin of the Medical and Chirurgical Faculty of the State of Maryland*.

Since my return in 1918 from the troubled fields of France I have heard many strictures of our Government because no effort was made to take advantage of the experience gained through the mistakes, the blood and sweat and suffering of those who were later to stand as our allies against the swarming, gray invading masses. These criticisms were natural enough, for the man detailed for observer's work slipped quietly out of his accustomed paths and took up his designated duties with no blare of trumpets and no publicity. He went at least "unheralded and unsung." I suppose a "military observer" might be properly classified as a sort of an international village pest. He was in everyone's way if he was doing his duty and he trod on very thin diplomatic ice in collecting for the advisement of his own nation the things which were needed to be known.

This was, as a matter of fact, less the case with those who were charged with the securing of information relative to the care of the sick and wounded than with the line officers who sought data in respect to the manner of making war, but nevertheless it was by no means an easy job to elicit any information from people who were none too sure what was to be the attitude of a neutral nation in the event that it did decide to join in the issue. Perhaps at this time it may be well to ask your indulgence if what I have to say savors somewhat of the first person singular of the personal pronoun; the deductions I made were largely drawn from my own experiences and it is a difficult matter to camouflage the "ego" under general experience. After all, what I saw and encountered was about what happened to others who were in the same business, and so the "I" may take on the shrunken characteristics of the exponent rather than standing boldly out as the coefficient.

At the time I received my orders to proceed to France, in November, 1915, we did not personally know a great deal in respect to conditions and necessities over there, and instructions to those sent were therefore rather hazy as to things which were later better understood. Several facts were impressed on us. First and foremost, that we were to collect information; information of any sort which might be of use to the United States in case we became one of the belligerents. Second, that while we were not absolutely under the orders of the embassy in France, it might be very embarrassing to us if there was any lack of accord between those authorities and us. Third, that we were to send no information to anyone save to the War College, which was to us as father and mother and protector of the poor and all the titles which the Mohammedans ascribe to the overlords of creation. And fourth, and fifth, and to the *n*th power, to send information and then more information.

Most boats row very easily to the man who sits in the stern, and from this side of the Atlantic it did not look as though it was going to be much of a job to go to France and send back unlimited dope in regard to how the wounded were cared for, after having minutely inspected the process from the front lines to the ultimate rear. It was not hard either, until I arrived there and started to put the theory into practice. In the first place, there are two very distinct kinds of spoken French. First, the kind *you* speak and after that the sort that the French understand. They are rather particular about it, and the fact that you spoke French fluently as a child and were under the impression that most of it had stuck was not as important as it first appeared. French that was is very different from French that is; I can bear testimony to that fact with perfect but not altogether satisfactory frankness.

I discovered it almost as soon as I landed at Dieppe, and within two weeks was a much wiser observer, so far as my limitations went, than I had been when I started on my mission. Further, bolstered by a diplomatic passport and with an established liaison with the American Embassy at 5 rue Chaillot it did not seem as though I was received with all the acclaim which this prestige should have guaranteed. So far as I could observe, the war went right on in the usual and accustomed channels, irrespective of the fact that I was there to take notes on it and send back my deductions for the benefit of an anticipatory government on the other side of the ocean. The ambassador was most charming and his staff entirely amiable, but it appeared as though they were fairly well occupied with many other important duties which had existed prior to my advent. The French War Office, as represented by the officials to whom I presented my credentials, was also charming, as charming as cultivated French gentlemen can be, but they also seemed to have pressing affairs which needed most of their personal attention; and while they figuratively turned over to me the keys of the house, they intimated that there might be days when they would be altogether too busy to play with me, the stranger from the other side.

I was a little bewildered by this inattention at first, but soon came to thoroughly realize one or two salient facts. So long as we were a neutral nation, it was not a matter of paramount importance to those at grips with an enemy whether we found out all the many things we wished to know or not. Later, when I had established personal friendships with French officers, there were two questions which were repeatedly asked me: First, "If the United States comes into the war, will she come with the Allies or with Germany?" Second, "If the United States does not side with Germany, will she enter as an ally or will she

make an independent war against Germany?" Now it is very easy to understand that people who had doubt along these lines—any doubt—should be somewhat hesitant and a little chary in regard to imparting any information of a military nature. In regard to backing by our own embassy, it was easily understandable that it would be embarrassing for them to ask from the French something which they were not willing to grant, and equally embarrassing to the French to refuse to a friendly nation something which it had requested. Therefore, the simplest way out of the tangle was to ask nothing at all, which made the way very smooth for both the Embassy and the French Government—but exceedingly rough and rocky for the anxious and perspiring observer. And so, the upshot of the whole matter was that we had it intimated to us, both by our own diplomatic representatives and our friends the French, that it was very probable that we should make more and better reports if we relied on our own ingenuity than if we counted on official recognition.

And that was the situation in which I found myself not long after I had left America for France. With only a few friends in an alien country, a knowledge of the language which left considerable to be desired, and no distinct, authoritative status with either our representatives or the French Government in so far as the gathering of the information I desired was concerned.

The accepted idea of the military observer as one who is pretty constantly exposed to war's alarms, who moves and has his being very largely in the zone of the advance, among the actively combatant forces, is more conventional than actual. In the first place, as I have intimated, the warring powers are fairly well cluttered up with the very practical business of assaulting the enemy and making it uncomfortable for him when he assaults in his turn, and have not very much spare time for the amenities of life so far as they concern benevolent neutrals. In the second place, there is probably much more to be learned in the regions farther from the scene of actual fighting.

General policies as to wound treatment, care of the sick, transportation, and matters of that ilk are worked out to their final perfection, not where the wounds are made but in some quiet office where the students of war patch together the bloody records and from this patchwork evolve a fair and practical scheme. And so, in the hospitals of Paris and of other places not in the zone of actual fighting, there were many things to be sought which might prove of value to our own forces in the time when our own fighting men should follow the echoing drum to the red edge of war.

Knowing that there are so many in these post-bellum days who have

a very personal and accurate knowledge of what war-time surgery is and of the things which arise in the meeting of the conditions which envelop and surround it, I have some hesitation in dwelling on them lest I be bearing coals to Newcastle.

All statistics and records show that the fighting in Flanders reversed the casualty percentages in respect to causative agents. Hitherto we had been called on to treat mainly those who had been laid low by small-arm fire. We were sharply brought face to face with the dominant part of weapons of large caliber, and the wounded per hundred swiftly shifted to a majority for artillery projectiles. Not only that, but even artillery wounds were neither those of the Crimea nor of our Civil War. Iron shell, broken by a relatively feeble explosive agent does not do the same uncanny, dreadful things accomplished by steel or semi-steel rent by glorified dynamite into many jagged, fast-moving fragments. I have a very keen recollection of the first practical realization of this fact.

During the early part of 1916, while I was with Dr. Carrel in Compiègne, I watched one morning while his clever surgeon, de Helly, operated on a French lieutenant who had been brought in from the lines less than an hour distant from this little city of historic association. The wound was one which involved the lower third of the thigh, the knee joint and a portion of the leg below. There was no great external laceration, but as incision and *débridement* traced down the track of the injury, there was more and more evidence of the relentless force which had caused the wound. The popliteal artery was severed and much contused, shocked tissue had to be cut away. I fully expected to see the operator finally extract something which should be about the size of a stove lid, and when with a pair of fine forceps he laid on a piece of gauze a fragment no larger than a pea it was hard for me to believe that this was the "*fons et origo*" of all the damage done. I have an idea that this was the conception which was inherent in the minds of most of us before we had the opportunity to examine the effects produced by high explosive, and of the razor-keen fragments which resulted from cleavage of the steel. I spent a very profitable three weeks with my always courteous and considerate friend Carrel and watched the progress of his patients under his system of treatment.

While there, I had a rather amusing and entirely enlightening proof of the fact that clothes *do* sometimes make the man. As a concession to the not insistently expressed wishes of the Embassy, we observers generally went clad in mufti instead of uniform. One morning I went to make a visit to a medical hospital which was installed in the Château de Compiègne. I was greeted courteously by the officer in

charge, but when I proffered him a card which attested the fact that I was a major in the Medical Corps of the United States Army and an accredited observer with the French armies, he turned in some bewilderment to the French medical officer who was there to vouch for me, and evidently assuming that because I had not spoken I was entirely ignorant of his language, said with a puzzled accent, "But this card says that he is a major; if that is so, why in heaven's name is he dressed up in a brown sack suit?" I dug up, that evening, a suit of olive drab from my kit, was greeted next morning with beaming approval by Carrel, and am forced to confess that for the rest of my stay continued as an officer and profited in evident respect by the change in my outward appearance.

One needed, unless he was a cripple, better credentials than a sack suit and a silk umbrella to get anywhere in the France of that time.

I visited many other hospitals in my capacity as a seeker after truths; and while the visits were always interesting, it may be readily realized that each one entailed a large amount of hard and studious work, since all that was of value in each had to be reduced to a report basis and sent home to the War College that it might serve its own purpose for the training of our own forces. What one saw was usually fairly simple of comprehension, but sometimes in converse with an enthusiastic Frenchman, started on a very animated discourse on something particularly dear to his heart, the foreign tongue grew pretty foggy and I groped wildly for the context. I paid a charming visit to Dr. Antoine Depage at his wonderful hospital at La Panne, and saw also a number of others which were in that neighborhood both in France and Belgium. I put in a month with Blake at his fracture hospital near Paris and also at other points of interest. Everything which might hold a kernel of interest was a nut that was worth cracking, and after each trip and each visit I forwarded the usual grist of reports of what I had seen and learned, until I came to wonder as to whether the War College would not beg for mercy.

With continued residence came a better understanding of the language of the country, and I found less and less difficulty in assimilating the information which was so kindly given me by busy, overworked men. Sometimes, though, there was a certain evil advantage in being especially stupid. I recall one trip which I made to the front where there were certain things which I much wished to photograph in order that I might send the illustrations with the written report. The French, while not so rigidly ironclad in their regulations as to the use of a camera as were the British, were sometimes averse to the practice. In this instance it seemed to me that the officer who was with me

looked rather puritanical, and rather than risk a flat refusal I commenced my picture-making before consulting him. He fidgeted for a minute and then started in to tell me that I should obtain written permission from the general commanding before I made any pictures.

Smiling vaguely I thanked him for his courtesy in unusually bad French and continued my nefarious photography. The more he protested the more doubtful and grateful I became, and before long he shrugged his shoulders in that inimitable gesture which combines the ideas of "poor idiot" and "what's the use" and let me finish. The only drawback to my strategy in this instance was that it precluded my asking him thereafter any intelligent questions, and I had to wait until he had disappeared to take up the thread of my discourse with someone else as an informant.

Duty of various sorts gave me opportunity to visit the lines pretty thoroughly from Dunkirk on the North Sea down through the Vosges Mountains to the Swiss border. At times my duties lay in the more or less peaceful interior, and again I had to be in the front lines and in the trenches themselves. It is hardly worth while to go into any description of things of that sort, for so many have come back who are better qualified to speak of them than I that I should feel rather shamefaced in recounting the experiences of a perfectly peaceful observer who sought only information. I have no hesitation whatever in stating that I never had the slightest love for gunfire, that I was always frightened when it was necessary to be shot over, and that I breathed a sigh of relief each time when the duty was done and I might with propriety seek less intense scenes of life. I am quite willing to concede that one may acquire a certain indifference to shot and shell, but I am very firmly convinced that I was born with an idiosyncrasy which will make it always impossible for me to belong to this class.

For the better part of a year I was the sole medical representative with the French, but at the end of that time I was supplemented by another, a most capable officer, and had the relief of planning and consulting with one of my own profession. This made matters less irksome, and there was the gratification which comes from "team work."

The acquisition of information, while often difficult, was interesting on account of the ingenuity which was necessary to produce the result desired. At one time I was much in need of some authentic information on a subject which was quite essential to us in the event of our entry in the war. There was one man whom I knew in Paris who was altogether competent to give it to me but he constantly slid, eel-like, through my fingers. Finally, by assiduous cultivation, a good deal of flattery, several most excellent dinners at Voisin's and kindred hostelrys, I

woke a spark of interest in him, and the affair finally arranged itself so that he wrote for me a beautifully complete report comprising some seventy pages of foolscap, illustrated it with working drawings to scale and photographs, and was as much pleased as I over the completed product.

The most difficult place at which to arrive, the very palace of the Lamas of Thibet, was anything which was expressed in figures. Statistics were altogether taboo, and any mention of them elicited merely a smile of good-natured amusement or a rapid change in the subject of conversation. This was altogether natural, for figures as to losses, even figures as to the number of beds considered necessary in any district or under any conditions, held too much significance to the enemy to make it allowable for them to creep out. Some approximate figures we did get by piecing together random statements from various sources, but it was not until after April 7, 1917, that I was able to induce anyone to tell me anything with the stamp of authority. At that time I went to see Monsieur Justin Godard, Chief of the French Sanitary Service, who had always treated me with all consideration possible, and after a few minutes' talk he asked if there were anything which I would like to know. I told him that, to speak very frankly, there was; and that what I most needed for the information of my country was statistics; statistics of killed, of wounded, of the classification of wounds, of medical personnel percentage, and of necessary bed capacity—any statistics, all statistics, and wound up my request by the remark that I supposed I was asking something so confidential that there was no hope of my obtaining it. After a few minutes' thought, he admitted that I could not have asked for any more confidential information, but that relations justified my request and that I should have them. He called in two high officers of his staff, talked with them a few minutes and then told me that he had instructed them to give me all that I might ask for, but that certain information they could impart to me only by word of mouth and that I must pledge myself not to put it on paper. I kept the promise, and this knowledge came back to the United States in that way. This I have mentioned as showing how carefully the French guarded the information which was vital to them, and from my own experience I can testify that the safeguards were very effective. It can be very readily understood that any accurate statistics were of the utmost value in formulating plans for our own part in the war. We had nothing to base our preparation on other than what had been the result of totally different types of attack; the figures of our own Civil War, those of the Russo-Japanese War, were altogether discounted by new methods, and to build on them

was to start from a false concept. Apart from an inversion of the ratio of killing by bullets and shell, it had become manifest that the plan of sanitary personnel would have to be revised to meet new requirements.

These figures, furnished by the French, were transmitted and formed at least an important part of our original estimate of what would be needed to deal with the condition to confront us.

As time went on, the demands for information became more insistent, and to meet these the number of observers was augmented from time to time. Finally there was formed a coalition of the observers for the United States, and the American Military Mission came into being, with a little more definite recognition from the French and with increased scope of usefulness. What had been rather a loose friendly association became a very systematized piece of machinery bound together by a good deal of office force and with very definite aims and objects. So much so that its members were assigned, according to the views of the members in council, to the securing of information along certain lines in accordance with the adaptability of the individual for the work. Reports were no longer individual matters, but were forwarded with the stamp of approval of the Mission as a whole, and those who had heretofore worked as individuals became part of a pretty smoothly functioning piece of machinery.

It is not at all probable that the extent of the work accomplished by this Mission, or by the men who composed it, will ever be definitely known, for what was collected was forwarded as confidential matter and the only records kept were in the Mission itself and in the Bureau in Washington to which the reports were consigned. Aside from what concerned medical matters, there was of course a mass of matter dealing with every other phase of making war, and an index of what was written would have covered pretty nearly everything which is concerned in this ugly business. It is due to the efforts of this Mission that the first detailed report of the methods and mechanics of gas as an offensive weapon came to the United States. The uniform in which our troops went overseas and which they wore throughout their time in France was exactly as recommended in a report sent in by this Mission. The plans for the first port of debarkation, with its camp site and the training area which was retained by our forces, were those arranged for by this same Mission. I mention these facts to show that much was accomplished by this group which would have otherwise been difficult of fulfilment. It was, as well as a source of information, a pioneer corps, and when the vanguard of our own army landed in France they found arrangements made which gave at least a start in the great task before them.

Aside from the very definite and clear-cut duties of collecting and forwarding information, there were also other sides to this unusual job. The military observer was thrown in contact with many men of many nationalities and found much that was interesting and also much that was very charming. Friendships were formed, some of them to last, and, alas, some of them to be severed by the grim chance of war. It was an education and an inspiration to come into contact with the sturdy fortitude, the fine courage which was everywhere displayed. The medical observer saw probably as much, if not more, of this than his brothers of the line, and it was a grateful compensation for the constant suffering which passed before his eyes in his daily work. No man could watch the careful dressing of the patient wounded day after day without a sense of pride that men could so rise above circumstance and give with such liberality to the country of their birth. Also, there was opportunity to observe the good work done by those of our own nationality who, as volunteers, were the forerunners of the many who were to cross the seas after them. It is hard to designate any single set in this work, but I think that among those who most appealed to me were the fresh-faced boys who drove the ambulances for their friends the French. They did much to hold the faith of our Gallic allies in the days when they were waiting for word as to our coming, and they held a very warm and real affection in the hearts of the soldiers of France. It was a young man's job and they did it as young men; with heads up, a cheerful grin on their engaging faces, and with utter disregard for the red hell through which they drove their ambulances. They deserve much tribute and much consideration for perilous service freely given, and all the way from the mountains of the Vosges in the south on up through the gun-racked fields of Verdun to Picardy and Flanders there are crosses to tell of the loyalty of that service, silent evidence that they were not afraid to give all in the quest for the great adventure.

It was my good fortune to come in contact with many representatives of the societies which were doing their merciful bit in gathering up the battered flotsam and jetsam of this tide of war. Their work has spoken for itself and my testimony could only add further to the long chapter of their appreciation. Personally, I was many times grateful to them for their ready help in forwarding me in my own work when official aid was out of the question.

I have been asked many times what was the attitude of those of the combatant nations to us, who were the undetermined neutrals. Personally, I never met with anything save the most perfect courtesy from those with whom I came in contact, both French and British. It was, of course, a difficult situation to be placed in, since at the last analysis

there is no such thing as a "neutral," considered from the standpoint of the individual, any more than it is possible for any thinking man to exist without an opinion and with an entirely empty, vacuous mind. The best which could be done was to remember always that one represented a country which was in a neutral attitude and to observe with the utmost nicety the diplomatic conventions which hedged this position on every side. I think this must have been recognized by those with whom I was thrown in contact, and there was never reference made which might have embarrassed me in any way. As I made friends and came into closer association, I *was* asked questions which plainly showed the intense and natural interest as to what my own country might or might not do, but these were worded in such a way as to neither distress nor offend me and I saw nowhere any of the bitterness which has at times been reported as existing against the United States. While this was so, it can be readily understood that there was a marked difference in all respects after we were declared allies. What we had before then sought as a concession from courteous people could be quite frankly asked for as a means toward the furthering of a common cause. And so, in the time between our declaration of war against Germany and that in which the Military Mission was merged with the forces of our own country, the business of being an observer was very much "de luxe." To be offered information, to have matters suggested for investigation, to have difficult doors swing open on easy hinges, to find that officers had been appointed for special liaison and were anxious to serve all our needs made one look back with wonder on the time when all information had been dug out of the solid rock, obtained only by patient planning, and the use of all manner of personal diplomacy. It was the icing on the cake, the rest after toil and what had heretofore been a hard and often discouraging task seemed marvelously simple.

Supreme importance was ascribed to many different things and methods just prior to our entry into the war. It was asserted that "Aeroplanes will win the war," that bread would do it, that this, that, and the other was the one sure asset on which to found our expectations. I wonder if you will think from what I have said that I have come back with a belated post-mortem cry that "observers won the war"? If so, I have given you a very wrong impression and must ask you to remember what I said at the start of this talk, that so far as my own reasoning went, preparedness was a correlation of many things, a meshing of countless little gears in a big machine and that it was for no particular small cog to claim credit save so far as it is engaged with the minimum of friction with those above and below it in the chain of power.

What did win the war was a unity of purpose and an adaptation of many means to one ultimate purpose. It seems to me that what counted most in the part which our own profession had to play in the game was that we were ready to lay aside the things of every day and take up and perform to the best of our ability strange tasks and unaccustomed rôles. I say "we" quite advisedly in this connection, for I have no distinction to make between the so-called "regular" services and the profession of medicine in general. It seems to me that to make any distinction was basing things on very false premises, for the useful alloy can be formed only by the perfect blending of the many metals which may go to compose it. What was necessary for us of the medical profession was means to minister to the hurt and to administer the machinery which should carry this out in the most efficient manner. Some could perform one part and others another, but neither was less to be valued because human possibility set certain definite limits as to this functioning. Each fraction was definitely essential in the composition of the total which was to spell success.

No one could, I am sure, look over the record of accomplishment without being proud of what was done and of the progress made. It is too much of a task to attempt to quote all the names which now stand out as having contributed to the perfection of matters which pertained to the better treatment of wounds and disease, but who of us is not familiar with the work of your own men, Finney, Thayer and Young along their particular lines of work? Of that of Carrel and Dakin and Lemaître and Chutro in methods of wound treatment? Of what was contributed to our knowledge of shock by Crile, Cannon, and Porter? Of the advances made in reconstructural surgery by Sir Robert Jones, Bastianelli, Morestin, Osgood, Goldthwaite, and others? Of Dunham's work on empyema and that of the British Commission and Strong in respect to trench fever?

How much better we are informed in respect to fractures through the patient, clever efforts of Blake, Souttar, Leriche, and Gosset; of the mechanics of poison gas through what Warthen, Sir E. A. Schaefer, Underhill, Winternitz, and others have written; how much Depage and Willems contributed to our store of information about surgery of the joints.

And so the list might go through many more names and among many countries and serve always as an index to the fact that where the national need calls, "there is neither border, nor breed, nor birth," and that after all there can be no class distinction among those who are pledged to a common cause.

And so, I think you must absolve me from any egotism in the fact

that I played a very small and very modest part as a military observer, for his duties, after all is said and done, are not those of individual achievement, but the faithful recording of what others have accomplished, the setting down for reference the discoveries which many men have made.

I have thought that perhaps some knowledge of the difficulties which hedged in the work might interest you and that it might be well for you to know that this silent service was in operation at a time when it was generally considered that as a nation we were taking no thought for the future.



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Original articles, items of news and matter of interest to the Services are welcomed. Requests for reprints should be made at the time of forwarding articles.

EDITOR,

COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

THE PROSPECTIVE CITIZEN IN RELATION TO NATIONAL DEFENSE

The ability of a nation to defend itself against enemies from without depends primarily on the unity, vigor, and intelligence of its people. It becomes important, therefore, to survey carefully the results of the physical and mental examinations of the large numbers of recruits in preparation for our part in the late war. It is essential also to consider the bearing on national unity and physical and mental vigor of the arrival annually of large numbers of aliens among us.

In consequence of six years of world strife there has undoubtedly been undernourishment and loss of physical vigor in certain areas, and bitterness and unrest are widespread. Among many populations there is not the respect for government which formerly prevailed. These are conditions to guard against, since it is well known that disgruntled and dissatisfied peoples, by means of migration, sow the seeds of their discontent in other lands.

As showing the degree of physical and mental defect among our composite population, which must be considered in relation to national defense, the records of the recent draft are highly significant. Out of the first 1,968,055 draft men examined for mobilization camps, 549,960 were rejected on account of physical defects which unfitted them for any military service. Thirty-nine thousand ninety-five men, or a ratio of

12.06 per thousand out of a total of 2,753,922 men examined, were rejected on account of mental deficiency. These large numbers clearly indicated the length to which public health measures must go in order that the male population between the ages of twenty and thirty may be relied on to the fullest degree to perform military service in times of danger.

Not every male may be expected to be physically and mentally fit to undergo the ardors of military service, but by means of efficient nation-wide hygienic measures, the numbers so fitted should be vastly increased. Had this ideal been attained before the war the problem of the care of ex-service men by the Government would have been greatly reduced and a far more self-reliant and hardy manhood would be the result.

Furthermore, a nation-wide educational system properly applied would prepare many more to perform civil duties of the highest value during the war for the common good. In order to provide healthy "illiterates" with the modicum of knowledge necessary to efficient military service classes of instruction had to be organized within the Army during the war. This knowledge should have been acquired previously through a thoroughly organized public school system.

As showing the great need of such instruction, the results of the grouping of draft men for mental tests is highly significant. So-called "beta" examinations were developed primarily for men who could not read and write, although it included others who corresponded in intelligence to the fifth school grade or less.

The percentage of draft men from all New England who were given the "beta" examinations amounted among the native born to 16.3 per cent of the total draft from that section, among the foreign born to 62.6 per cent and among the negroes to 79.5 per cent. Measured by this standard, "literacy" among the foreign born averaged but little higher than among the negroes of that section.

Out of 2,338 men of the draft from New York City, specially reported on, 32.6 per cent were given the "beta" test. Of the American born 0.4 per cent were recommended for discharge from the Army on account of mental age of less than 9 years, and of the foreign born 1.67 per cent, or four times as many, were recommended for discharge for like reason.

According to the U. S. Census of 1910, 12.7 per cent of the foreign born over ten years could not write;¹ a very unfavorable figure as

¹Bureau of the Census classifies as illiterate any person ten years of age or over who is unable to write, regardless of ability to read.

compared with 3 per cent for native-born whites, and among the foreign born of military age (20-34 years) the percentage of illiteracy was even higher.

Not only from the standpoint of intelligence are many foreign born at a disadvantage, as compared with the native born. Physically, many racial groups are inferior in height, weight, and in other ways. In general, draft men from the Eastern Seaboard were not the equal in these respects to men from the interior and western States, and this is attributed to the large admixture of foreign born.

What may be the ultimate effect of continued and increasing immigration of dissimilar populations on national unity and the physical and mental vigor of our people? In the years to come it will undoubtedly be profound.

Within the decade 1905-14 inclusive, 10,059,340 aliens arrived on our shores. In the absence of further selective or restrictive provisions of law, these numbers are likely to be exceeded. It is impracticable to assimilate properly such vast numbers. From the standpoint of national safety alone it would seem time to call a halt; from an ethnologic standpoint the time is long since past. The problem is one for earnest consideration and action by every citizen who would protect his inheritance and preserve it for his posterity.



ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, February 21, 1921, the following names were proposed and elected to membership in the Association:

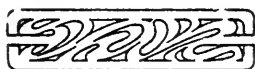
United States Public Health Service	John William Mintener
<i>P. A. Surgeons</i>	Hersey Elroy Orndoff
Lewis A. Bradbury	<i>Captains</i>
Norman Y. Hooper	J. C. Cobey
Clarence A. Jacobson	Henry R. Lesser
Arthur Lederer	<i>First Lieutenants</i>
<i>Asst. Surgeons</i>	Robert P. Frazier
Harry William Burns	Jacob A. Kohn
Charles J. Hufnagel	Medical Corps, U. S. Navy
Charles Rudolph Steinfeldt	<i>Lieutenant</i>
Oscar Charles J. Ericksen	Robert Harold Donnell
L. A. Wilson	Medical Corps, U. S. Army
Medical Reserve Corps, U. S. Army	<i>Captain</i>
<i>Lieut. Colonel</i>	Milton Shaw
Frank Butler Granger	Associate Member
<i>Majors</i>	Lieut. Comdr. Griffin Guy Frazier,
Leon W. Jessaman	Dental Corps, U. S. Navy
Cleveland Charles MacLane	

At a meeting of the Executive Council on February 21, 1921, the following amendment to the by-laws was introduced and approved by the Council and is published herewith in accordance with the provisions of the Constitution and by-laws:

Resolved, That Section 4, of Article IV, which reads as follows—"The Annual subscription to the official journal by members of The Association shall be three dollars (\$3.00), payable in advance and the journal shall be stopped on expiration of unrenewed subscription"—be amended by substituting words and figures three dollars and a half instead of three dollars.

The Annual Meeting, as noted in our last issue, will be held at Boston, Mass., June 2, 3, and 4, 1921, immediately prior to that of the American Medical Association, thus giving opportunity for medical men who are members of both associations to attend the two during one trip. It was with this fact in mind that the Council decided on this place and date and it is hoped that the attendance will be materially increased in view of this arrangement. Invitations have been sent to a number of the allied governments and it is expected that representatives will be present from them. The headquarters and meeting place will be the Copley-Plaza Hotel. As soon as practicable, a tentative program

of the literary exercises will be published in *THE MILITARY SURGEON*. It is desired that the attendance at this meeting may be full, in order that there may be free discussion of the papers presented, since this always adds to the interest of the meeting. It would be well for members of the Association to advise any physicians not members of The Association of Military Surgeons, who contemplate attendance at the meeting of the A. M. A., that they are welcome at our sessions, that this attendance may be generous, and that those who are not already acquainted with the character and objects of the Association may thereby become more familiar with them.



CORRECTION

In the March, 1921, issue of *THE MILITARY SURGEON*, the death of Major Henry R. Carstens, M.R.C., U. S. Army, was noted on page 372. This was an error, the death recorded should have been that of Major J. Henry Carstens, M.R.C., U. S. Army.

COMMENT AND CRITICISM

HOSPITAL LIBRARY AND SERVICE BUREAU

The Hospital Library and Service Bureau of The American Conference on Hospital Service, 22 East Ontario Street, Chicago, Ill., has been organized by national hospital, public health, nursing, social service, and other organizations, aided by the Rockefeller Foundation. It will serve, gratuitously, those persons interested in the construction, equipment, and operation of hospitals, sanatoriums, dispensaries, health centers, and institutions of like nature.

The following is the tentative outline of material to be collected by the Hospital Library and Service Bureau. It is published in its present form to elicit the comments and suggestions of readers, and while this covers what is to be collected, only a small amount of this material is as yet available, it being contemplated that announcements will be made from time to time as material becomes available for reference purposes:

HOSPITAL LIBRARY AND SERVICE BUREAU OF THE AMERICAN CONFERENCE ON HOSPITAL SERVICE

I. THE HOSPITAL FIELD

	Methods of determination of needs of	{Hospital Dispensary Sanatorium}	Service.
	Community surveys, methods of community organization and preliminary planning.		
	Financing.....	(Methods of estimating capital funds for construction and maintenance. Finance committee organization. Securing funds for buildings, endowment, current expenses, etc. Aid from public funds—data to be compiled from state laws. Publicity methods employed in financing. Community chests and federated charities. Educational campaigns and "drives."	
I. The hospital field..	Classed by control.	Public.....	{Town. Municipal. County. State. Federal.
		Incorporated	{For profit. Not for profit.
		Private.....	{Personal ownership. Group ownership
		General.	
	Type of hospitals.		{Nervous and mental Isolation. Tuberculosis. Convalescent. Children's. Orthopedic. Maternity. Surgical. Eye Ear, nose and throat. Skin and cancer. Medical Diagnostic. Drug addiction
	Classed by service rendered.....	Special	

II. CONSTRUCTION OF HOSPITALS

II. Construction; Hospitals, Dispensaries, Sanatoriums.	Floor plan files.	Hospitals as a whole.		
		Special departments...	Administration.	
			Kitchens.	
			Wards.	
			Operating rooms.	
			Dispensaries.	
			Nurses' homes.	
			Service buildings.	
			Laboratories.	Pathological.
				X-ray.
	Clinical.			
	Follow-up comment on plans after a year of operation.	Materials....	General description and serviceability.	
			Comparative costs, etc.	
			Index of architects, consultants, and builders.	
			Costs of buildings	Records of building costs as far as obtainable.
				Lists of equipment used in individual hospitals, dispensaries, and special clinics.
Hospitals.				
Departments.				
Follow-up comments on equipment after one year of use.				

III. OPERATION OF HOSPITALS

III. Operation.	Development of general internal organization.....	{	Diagrams of organization. Literature on organization, constitution and by-laws in use.
	Affiliation with.....	{	Medical schools. Church. Industry. Others.
	Community relations with	{	City, town, and county. Local relief-giving organizations. Public or legal supervision of illness and health.
	General relations	{	With national, state, health, hospital, professional, and departmental activities and organizations.
	Staff...	{	Organizations. Responsibilities. Work.
	Keeping professional records..	{	Policies. Principles. Systems.... { Equipment costs. Maintenance costs.
	Nursing.....	{	Training schools. Private duty. Operating room. General duty. Departmental.
	Laboratories.....	{	Pathological. X-ray. Clinical. Serological. Departmental. Metabolic. Dietetic.
	Purchasing.....	{	Equipment. Supplies. Special.
	Mechanical...	{	Engineering and all mechanical departments. { Policies and plans in use for securing and supervising.
	Dispensary (when a department).....	{	General organization. Staff organization. Community relations. Social work. Policies as to fees.
	Social work.....	{	Organization of department. Policies and work.
	Accounting.....	{	General principles. Policies in use. Systems.
	Charges for service....	{	General principles. Policies in use. Record of schedules used by hospitals of different sizes, classes, etc.

IV. TRAINING OF HOSPITAL PERSONNEL

IV. Training of hospital personnel....	1. Administrators.	Schools. Courses. Methods.
	2. Nurses.	
	3. Laboratory and x-ray technicians.	
	4. Pathologists.	
	5. Dietitians.	
	6. Anesthetists.	
	7. Social service workers.	
	8. Internes.	

V. ORGANIZED ACTIVITIES BEARING ON THE HOSPITAL FIELD

V. Organized activities bearing on the hospital field.....	Direct....	General hospital associations...	U. S. and Canada. Foreign. State. Local.
		Professional associations.....	Medical. Surgical, etc. Social service. Dietetic. Nursing.
		Departmental associations...	Pathological. X-ray. Clinical. Serological. Metabolic. Dietetic. Departmental.
		Laboratory	
	Related..	Public health...	Mental hygiene. Tuberculosis. Housing. Child welfare. Health centers.
			Public health. Industrial. Military.
		Government....	Army. Navy. Public health. Other departments producing material of value to hospitals.

VI. ASSOCIATED INFORMATION

VI Associated information...	Vital statistics.			
	Insurance reports.....			
	{ Life. Sickness. Accident. Industrial. Fire.			
	Compensations or subsidies.....	{ Industrial {	State { Policies and methods Direct { use.	
			From other insurance.	
			From city, county, or state.	
Legal.....	{ Decisions. State and Federal laws affecting hospitals, dispensaries, etc. Pending legislation.			

VII. HOSPITAL LITERATURE

	Libraries.	Subject and author's index.
	Books, publishers, and authors	
	Periodicals.	
VII. Hospital literature.....	Reports.....	Federal.
		State.
		Municipal.
		Hospital.
		Health departments.
		Surveys, etc.
	Hospital statistics.	

CHLOROPICRIN AS INSECTICIDE

Experiments carried out with chloropicrin in France have shown that this poison gas is a very effective weapon when used against vermin and insects. No other method, it is claimed in the *Archives de Med. et Pharm. Navales* (December, 1920, p. 448), is so successful in ridding a building of fleas. A quantity of chloropicrin corresponding to 5 g. per c.m. is placed in each room to be disinfected, and in a few hours every flea is dead—in carpets, furs, clothing, or no matter where else they may have installed themselves. The gas has no action on metals, paints, or dyes, and all fumes are removed by a few minutes ventilation. Dr. Minguet of the French Navy considers this method as particularly convenient for the destruction of vermin and insects on board ship, and urges its routine adoption by the French Ministry of Marine both on account of its intrinsic virtues and on the grounds of economy. The estimated cost is 13-14 francs per litre. (London *Lancet*, February 5, 1921.)

NEWS ITEM

The New York Post-Graduate Medical School and Hospital announces that there will be available this year six scholarships under the terms of the Oliver-Rea Endowment.

The purpose of the Endowment is to award scholarships to practising physicians of the United States to defray in full the expenses of tuition at the New York Post-Graduate Medical School.

According to the wishes of the donor, physicians in the State of Pennsylvania will receive preference in the award of these scholarships.

Applications may be sent to the President of the New York Post-Graduate Medical School and Hospital, 20th Street and Second Avenue, New York City.



BOOK REVIEWS

THE WATERING PLACES OF SWITZERLAND. Published by the Official Information Bureau of Switzerland, 241 Fifth Avenue, New York City.

This pamphlet, in addition to a general chapter as to Switzerland and the Swiss, describe nine of the more important health resorts, giving indications for treatment at the different ones as well as contraindications and analysis of the mineral springs located at each. It should be of use to a physician wishing to recommend special treatment of this class. The makeup of the pamphlet is most artistic and the half-tone illustrations of the various resorts are unusually well done. In the letter accompanying it the following statement occurs: "Any physician interested in the subject may write to the Bureau for a gratuitous copy of the work."

AMERICAN RED CROSS WORK AMONG THE FRENCH PEOPLE, by Fisher Ames, Jr. New York: The Macmillan Company. 1921.

This is the concluding volume of the record of what the Red Cross did in Europe toward alleviating the suffering caused by war. It gives, in the beginning, credit to the excellent work done by the "American Relief Clearing House," that association which was put in operation at the time when Mr. Myron T. Herrick was our Ambassador in France and which carried on so ably the task which was later taken up by the Red Cross.

The different phases of the relief work are outlined by Mr. Ames, and clearly covered. To any one reading what he has written will be furnished a very clear idea of the versatility of the relief afforded by the association. In succinct fashion he details the operations from the canteens at the front back through hospitals of the rear to what was done for the civilians and for the soldier who had, by reason of wounds, lost his usefulness as a combatant. It is good reading; a good record of a great and good work. There is perhaps a bit too much politics in the preface, but this does not weigh against what is covered in the text.

DISEASES OF THE EAR, by Philip D. Kerrison, M.D., Aural Surgeon to the Willard Parker Hospital for Infectious Diseases; Aural Surgeon to the Manhattan Eye and Ear Hospital; Fellow of the American Academy of Surgeons, Member of the American Otological Society; American Laryngological, Rhinological and Otological Society; American Academy of Ophthalmology and Otolaryngology, New York Otological Society, and New York Academy of Medicine. 332 illustrations in text and 2 full pages in color. Second Edition, revised and enlarged. Philadelphia and London: J. B. Lippincott Company.

This well-known book has been brought up to date and two new chapters added, the one dealing with Barany's theory of cerebellar control of joint movements and a discussion of pointing tests and their relation to vestibular and cerebellar disease and the second with the various types of war deafness.

The book as a whole is well conceived and written and thorough throughout. The chapters on lesions of the labyrinth are of particular interest and value as are also those on intracranial lesions of otitic origin.

In this age of perfection of illustration one expects better than some of the cuts in the book which, while they may fairly depict the subject, are not always too clear and certainly do not compare favorably with the illustrations one finds in most medical books of the day. The subject matter of the text is so admirably presented that this minor defect is overshadowed.

T. E. OERTEL.

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MEDICAL DEPARTMENT PROGRAM OF HOSPITALIZATION AND EVACUATION OF AN ARMY IN PREPARATION FOR BATTLE

By COLONEL A. N. STARK

Medical Corps, United States Army

STUDENTS in pursuit of knowledge in the domain of medico-military tactics relating to large forces find a paucity of information in text-books and manuals of strictly American authorship.

The medico-military tactics of the division are well presented in the light of knowledge acquired prior to the World War, but the subject of corps and army participation is briefly dismissed, and until the specific functions of corps and army surgeons are defined in the text to be issued by the office of the Surgeon General students can acquire only a mass of uncoordinated data for a guide.

The writer has discovered that a great majority of medical officers, influenced by the perusal of text predicated upon past wars, assume that the surgeons of armies, corps, and divisions prepare their portion of the battle orders of their respective commands without reference to the coordinate action of the entire force.

Such an assumption is fallacious in the extreme, for it presumes an independence of action that is contrary to military teaching, and if permitted would speedily create a confusion that would spell disaster.

To properly grasp the functions and limitations of the surgeons of divisions, corps, and armies the student must first comprehend thoroughly the relation these officers bear to the General Staff of their respective units and the control exercised by the latter.

Having informed himself upon this relation which admits of no argument, he is in a position to realize the coordinate control exercised by an officer of the General Staff of divisions, corps, armies, and General Headquarters over the functions of the Medical Department as well as over those of the other administrative, technical, and supply services.

It is not the purpose of this article to enter into an exposition of the functions of any surgeon below an army command, for a knowledge of

the duties of this officer can by analogy and correct interpretation of Tables of Organization and Equipment be easily transposed to fit the functions of the lower units.

The supposition that in forming a battle order all members of the staff are convened with a view to arriving at a decision after discussion of the pros and cons in relation to the mission can be dismissed as idle.

The truth is, the staff members of the technical and supply branches are summoned by the Assistant Chief of Staff for Supply, and with him go over the proposed military program prescribed by the Commanding General and compare this program with the map of the sector upon which is delimited the phases and objective lines of the proposed movement.

Only one map and one copy of the detailed instructions are available as a rule, and it is therefore incumbent upon each member to make notes relative to the program in general and to his service in particular, as it is usually the only opportunity to examine the master map and the details of execution.

Extreme care is necessary in making notes, for the personnel of the headquarters of an army is such a large aggregation, division into echelons is usually necessitated, and the surgeon is sometimes located, unhappily, many miles from his immediate chief—the Assistant Chief of Staff for Supply—with poor telephone communication and no priority of service.

Having applied the information gained, to a map of similar scale to that upon which the mission was delimited at the conference, the Surgeon calls in his own assistants and details the duties of each in preparing for the movement directed.

No detailed Tables of Organization having been published to date giving the assistants of an Army Surgeon, it may not be amiss to state here that he has the following principal ones:

- A Sanitary Supervisor and Epidemiologist,
- A Director of Hospitals,
- A Director of Ambulances,
- A Surgical Chief,
- A Medical Chief,
- An Orthopedist,
- A Gas Officer,
- A Neuro-psychiatrist,
- A Urologist,
- A Personnel Officer,
- A Medical Supply Officer,
- A Laboratory Chief,

A Dental Supervisor,
A Veterinary Supervisor,
A Contact Officer, M.C. (with Assistant Chief of Staff for Supply),
An Evacuating Officer, M.C., for each corps sector.

The above are absolutely essential, and it may become necessary to detail more officers from subordinate units to meet the requirements of a modern army.

Knowing the number of units to be employed and the extent of terrain to be covered, it behooves the Surgeon to personally examine the terrain with a view to deciding upon the tentative location of the hospitals, the medical supply depots, the veterinary units, etc.

In making this reconnaissance of locations for the above, the Surgeon is accompanied by the officers in interest if time affords, otherwise he must do so alone, for a survey is absolutely essential with regard to roads, rail trunks and side tracks, water, fuel, concealment, and priority of right to occupancy in relation to some other service.

In this survey he consults with the corps surgeons who have examined their respective sectors and are in a position to know the extent of hospitalization and evacuation required in relation to the mission of their corps.

Having made tentative choice of location for his units the Surgeon must in person reconcile it with the view of the Assistant Chief of Staff for Supply who may have assigned one or more of the selected points to another service with priority.

The sanction of the Assistant Chief of Staff for Supply having been secured, the Surgeon must then go over in detail with the railway technician in the office of the Regulating Officer the question of the number of hospital trains in 24 hours that may be routed over certain lines and the time allowed for loading, for it must be remembered the Medical Department has no monopoly of rail service and that hospital trains must always give right of way to trains for ammunition and the automatic replacement of supplies, and that no train will be permitted to halt on the fair-way for any purpose in the zone of the army.

Sidetracks are therefore of dominant importance, and the technician having absolute knowledge of their length anywhere within the sphere of the Regulating Station Zone, in relation to the length of hospital trains, the Surgeon can ascertain whether certain tracks must be constructed or lengthened, as the case may be, and if either is to be done he turns over the data to the Assistant Chief of Staff for Supply with request for accomplishment by the Engineers.

The Medical Regulator assisting the Regulating Officer is advised as to the estimated number of hospital trains which will be placed in com-

mission and which will be garaged near the front; and this question deserves a word in passing.

It has been customary in the past to estimate expected casualties in percentages based upon statistics of past wars and single battles, but this system is most barren of result, as many factors enter into modern warfare which complicate the computation, not the least of which is the introduction of new vulnerating agencies and a preponderance of machine guns and artillery, together with the nature of the terrain which human agency has altered from the normal.

To emphasize the above, prior to the St. Mihiel Offensive several Regulating and Medical Officers met in solemn conclave to predict the number of hospital trains the American forces would require, based upon the expected casualties; and the French, having already attempted the reduction of this salient, insisted from their knowledge of the enemy armament that 100,000 casualties in the three days' movement would require evacuation.

While none too sanguine, the American representatives could not entertain such a pessimistic view, and the opinion of a conservative French Chief Surgeon of vast experience was sought and obtained, to the effect that 33,000 would be about the number, all things considered.

It is a matter of history that less than 7,000 all told required evacuation, and with this object lesson constantly in mind no further attempt was made at prediction, as in fact any prediction of the probable losses in the Meuse-Argonne Offensive would have been a waste of time, so it was agreed with the Medical Regulator that the number of hospital trains provided would be based entirely upon the number of evacuees reported to him twice daily by an officer detailed for this purpose in each corps sector.

In addition to this data for hospitals the location of veterinary evacuating points must also be settled, and arrangements made for the information on these evacuations to be given the Regulating Officer through the veterinary officer in the Surgeon's office.

The Surgeon, having obtained the necessary data from the technician, is now in position to make out his portion of paragraph 4 of the battle order for submission, and when approved it is issued in the body of the battle order to the Corps Commanders and forms the basis upon which the Corps Surgeons erect their paragraph 4 of the Corps Order, which in time is submitted to the divisions for their guidance.

While the Surgeon is engaged in collecting the data necessary for the preparation of the order that inaugurates the coordination of the entire Medical Service of the Army his assistants have been thoroughly engrossed in their respective duties.

Schedules of needed personnel, units, supplies, and transportation are prepared and forwarded to their respective sources, and those units within the army area are assigned to positions and their personnel and supply augmented rapidly from available resources.

It must be impressed upon both division and corps surgeons that *an evacuation hospital must be located upon a railroad to insure an outlet*, for otherwise a congestion will occur in the field and surgical hospitals, with a consequent cessation of that steady flow of evacuees to the rear which must be maintained at all costs.

The sole exception to the rule for establishing an evacuation hospital upon a railroad is the possession of a superabundance of ambulances, a condition that will never obtain in any army.

Constant pressure will be brought to bear upon the Surgeon to move the evacuation hospitals nearer the line, but this in the vernacular is an effort to "pass the buck" in the way of responsibility for transporting casualties, and should go unheeded, the rule being in a war of movement to maintain these establishments at a fixed distance of 12 miles from the line, provided always a railroad and other vital facilities exist, and if not then at a point where they do exist, even if the distance casualties are to be transported is markedly increased.

While an Army Surgeon may have all confidence in the prowess and efficiency of the force he serves he must exercise conservatism in the placing of his heavy units near the line, for the fortune of war is too capricious and the judgment of man too often faulty.

It is held by some surgeons that special hospitals should be provided for fractures and cranial injuries, as well as for gassed, contagious, and neuro-psychiatric patients, but it is almost the unanimous opinion of the American surgeons that evacuation hospitals should receive and care for all classes of cases irrespective of their nature, and the new Tables of Organization will be found to support this view absolutely.

The employment of gas, contagious, and neuro-psychiatric hospitals by the American Expeditionary forces was dictated by the lack of sufficient evacuation hospitals and not by any peculiar desire for them, for such establishments create an unconscionable drain upon personnel, equipment, and transportation, and once allowed grow and multiply apace.

The medical officers detailed to collect the evacuation data for the Medical Regulator link up the hospitals within their sectors and require the evacuation officer at each hospital to make prompt report to them twice daily at the places they select for their stations; at the same time they make preparations to render reports to the Army Surgeon or to the Contact Officer with the Assistant Chief of Staff for Supply.

The Director of Hospitals sees to the needs of his charges and that the duties of the triage, proper treatment, and proper evacuation are thoroughly understood by the officers responsible for these functions, particular and intensive training being given in loading hospital trains, and in seeing that never less than 3,000 rations are kept on hand in each rail-head hospital in the event that a hospital train has to be provisioned in emergency.

He examines crossroads to insure of their being conspicuously marked by signs giving the direction and the number of each hospital the roads lead to, and that any broken bridges or shell holes are repaired. The disposition of hospital units of the medical regiments attached to the Army Headquarters is his duty, for there are large numbers of units employed in the army area without hospitalization facilities. Provision must also be made for sick prisoners of war at the prison enclosure.

The Director of Ambulances insures the integrity of the companies of the Medical Regiments and assigns each company or part thereof to its particular duty, and sees to it that the drivers know the roads involved in their transport, and also the rules of the road as given in the orders governing circulation.

The Sanitary Supervisor assigns the sanitary companies of the Army Medical Regiments to their zones of duty and sees that their duties therein are understood. These sanitary companies in the training area perform the duties of supervision of sanitation, and constitute an important reserve at the disposal of the Army Surgeon. In combat they have a triple function—supervision of sanitation, reinforcement of litter bearers, and on occasion the conduct of collecting stations.

The Surgical and Medical Chiefs and the Gas Officer take steps to insure the adequacy of standardized treatment in the domain of each, and that the hospitals are fully organized to meet the requirements of their special functions. This supervision extends down through the divisions.

The Orthopedist insures the training of the medical detachments of divisions and corps in the application of splints under all conditions, including darkness, and sees to it that the evacuation and surgical hospitals have splint teams competent to make correct application and save thereby precious moments to the operating teams.

The neuro-psychiatrist pays especial attention to the duties of his subordinates attached to divisions, for the chief function of the latter is at the sorting (triage) hospitals in making prompt differentiation between genuine and spurious so-called "shell-shock," and upon the antecedent training of these specialists depends in large measure the successful stopping of a leak in human conservation that if left unattended would quickly exhaust the man power of the combat force.

The Urologist, whose normal duty is dealing with prevention of venereal disease as well as with the treatment of the infected, is logically the one to assume charge of the disinfection of the command, and he therefore interests himself in freeing the combat force of vermin, and in advising upon the best measures for quickly curing those affected with itch and other cutaneous annoyances that are concomitant with war, and which, through causing loss of sleep, quickly debilitate a command, with consequent loss of morale.

The Personnel Officer is kept busy replenishing the deficiencies in commands and in making assignments and reassignments upon his own initiative in ordinary cases, and upon the advice of the Chief Consultants where specialists are concerned.

The Medical Supply Officer having requisitioned for a maximum stock, authorized by the Surgeon, upon assuming charge of the army medical depot makes issues to subordinate depots and to army troops in an informal manner and then makes a stock report to the next echelon in rear which fills his shortages. He receives replenishment from the depot in the rear automatically, supplementing his stock at any time in emergency by wire, phone, or messenger.

It is well at this point to understand that requisitions in the zone of the Army must be informal, and that accountability must give way to the necessity for supplying needs without thought of paper transaction as in peace time, for the Medical Department must be imbued with the spirit that actuates the Army as a whole—to win at any cost—and nothing must be permitted to diminish that spirit through the handicapping of the actors.

The Laboratory Chief maintains his army laboratory in proximity to the medical supply depot for obvious reasons, and sees that all is in readiness for the analyses his units will be called upon to make, and to receive, preserve, and ship the pathological specimens so necessary in the pursuit of study of the effects of lethal agencies and disease upon the human organism.

The Dental Supervisor oversees his subordinates in every detail, and in particular in regard to the first treatment of those facio-maxillary injuries which they will be called upon by the surgeons to assist in.

The Veterinary Supervisor is particularly engaged in the preparation of the veterinary hospitals and the conduct of evacuation, in the examination of the replacements of animals and the condition of those in service, in the examination of meat and food products received, and in the handling of the same after receipt.

The Contact Officer, attached to the Assistant Chief of Staff for Supply, prepares to receive casualty reports from the divisions, corps,

and army troops, for his compilation forms the daily report of casualties by class and by command for the information of the Army Commander.

The Surgeon and the Contact Officer must be in constant touch, for it is usually through the latter that information or instructions are received from the Army Commander. Some will contend that this method of communication is not contemplated in General Staff control, but the writer is dealing with a concrete fact and not a theory, and having had an experience that has fallen to the lot of no other officer of the Medical Corps in the actual conduct in battle of the Medical Department of the largest single army in history, knows fully the procedure that was countenanced by the Commanding General of that army with very excellent results.

The Convalescent Hospital Commander prepares his unit for the reception and treatment of cases requiring from ten days to two weeks hospitalization for minor injuries and sickness, as well as for dental and urological treatment, the hospital being located within the Army Area in conjunction with the Replacement Camp in order that the minor cases received may be retained in the Army Area and speedily returned to their units when pronounced fit for duty.

The Medical Department portion of the battle order being ready for issue, the Surgeon must transmit at once by special messenger a copy to the Group Surgeon if there be one, and *always* to the Chief Surgeon or Deputy Chief Surgeon of the Expedition at General Headquarters, for much depends upon the latter receiving first hand information, as he is the one who makes provision for the necessary additional personnel, equipment, and transportation, and coordinates the service of the front with that of the service of supply in all matters dealing with the Medical Department.

In making the disposition of his evacuation and surgical hospitals and ambulance companies the Surgeon deliberately excludes certain units from the battle order and has them placed in a position of readiness packed, in the event of an advance or retreat, but instructs the personnel to assist in the conduct of the units established near by.

It is a sound principle to exclude certain units before battle is joined, for the Surgeon does not live who can predict the result of the first contact, and should his side advance or retreat he must have units ready to follow, or precede in retreat, as the case may be, which would be impossible with units immobilized by the fact of having received wounded.

As the Commander of an Army does not find it necessary to impart his entire plan of campaign to his subordinates, neither is it incumbent upon the Surgeon to explain to his subordinates why this or that hospital is employed or excluded, and it is the manifest duty of those subordinates

to accept the orders as issued without comment, for it should be patent to even a mere tyro that the Commander issues orders which the Surgeon *recommends* only, and that criticism of such orders bearing the authority of the Commander is in effect criticism of the Commander, who is thoroughly competent to conduct his campaign without the gratuitous and thoughtless advice of uninformed subordinates who for personal reasons frequently desire something more to their liking.

By holding out several hospitals during the first phase of the Meuse-Argonne Offensive the writer was enabled to promptly support the Second and Thirty-Sixth Divisions in the Champagne sector on October 3, 1918, which support would have been impossible had all hospitals been immobilized by the reception of casualties.

It must be apparent that the Surgeon of a large army must be more or less ubiquitous, and until the forces join battle he must expend his energy and that of his assistants unstintedly, leaving nothing undone that his resources permit or that human ingenuity can provide.

Therefore, he must survey his units and those of the corps and divisions carefully, advising here, counseling a change there, and endeavor in every way to mold the entire Medical Service into a homogeneous whole and a smoothly functioning machine in which each unit is but a part.

To accomplish his end, which is coincident with that of the mission of the command, he must have the loyalty of every subordinate, and, considering failure in loyalty as equivalent to working for the enemy, must take the steps necessary to dispose of the disaffected for the good of the whole.

The responsibility for the care of battle casualties and their evacuation in a steady stream in such a manner that the course of combat is not interfered with is a tremendous load that is wearing in the extreme, and he who has this responsibility thrust upon him must submerge self absolutely in the attainment of his mission, without partiality, favor, or affection, for the Commander will accept nothing less than successful performance from his Medical Service, and will accept no excuses for failure.

It is manifest that the success of the Medical Service in battle is largely dependent upon the antecedent information given the Surgeon, for it is imperative the Medical Units be in a position of readiness at all times, and being of large bulk time is necessary to install them in the most advantageous positions and prepare them for their intensive function.

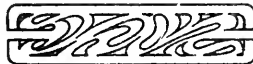
Often in the excitement and hurry of preparation for battle there is a tendency in *new* commands to forget this information which should be

imparted to the Surgeon as soon as a movement is decided upon, but this fatal omission is *never* observed in a command whose staff is *thoroughly* experienced in the duties devolving upon its members, *nor* in which this error has once been perpetrated and which has suffered that disaster which always follows with a certainty that is axiomatic.

In moments of crisis many will offer gratuitous advice upon questions that antecedent training has not fitted them to give, and it is at such times that the Surgeon must be firm in adherence to the approved policy for the conduct of his service, and employ his resources fully to meet the crisis, fortified by the confidence reposed in him by his Commander and confident of the response of his subordinates to meet the issue.

Esprit in the ordinary acceptation of the term does not fully express that intangible something which is developed in the team work of the Medical Department in combat, and which impels ambulance drivers to enter the line of fire when necessary with an utter disregard for consequences, and other elements to perform beyond the call of duty in the attainment of that sacred end—succor of the wounded.

This mental attitude, which can only be developed in a spirit of mutual confidence and in friendly rivalry, must be fostered in every way, for it is the sign manual that a particular Medical Service has attained that degree of perfection in performance which takes count of no obstacle on the road to success.



RECONSTRUCTION WORK IN THE UNITED STATES ARMY HOSPITALS

BY WM. J. TINDALL, M.D.

Major, M. R. C., U. S. Army

RECONSTRUCTION WORK as carried on during and after the World War in the military hospitals of the United States is so extensive a subject that it is not practicable to deal with it in detail in the limits of an ordinary article. In the following account I have endeavored merely to outline some of its outstanding features in an entirely informal manner, from the standpoint of one whose work was, and still is, in this field.

Broadly considered, reconstruction work means the maximum restoration of the patient's powers, both physical and mental, so that he may again function as a whole man in as large a measure as is possible. Upon this task, the physical rehabilitation of the disabled men, all the resources of the modern therapeutic armamentarium have been brought to bear in the military hospitals of the United States; that is to say, all the known curative agents, including not only the most approved methods in drugs and surgery but all those other and comparatively newer agents or modalities which are nowadays grouped under the general name of Physio-therapy. These are electro-therapy, hydro-therapy, thermo-therapy, massage, and exercise in its various forms. Their use constitutes the physical treatment. There is, however, also a mental side. It is generally recognized that the patient's physical recovery is frequently more or less dependent on his mental state, and consequently what is known as Occupational Therapy has been incorporated in the reconstruction work chiefly for its tonic and stimulating effect on the mind. This work has developed several features, of which more will be said later.

Physio-therapy scored signal success in the reconstruction service of the military hospitals and demonstrated its value beyond peradventure.

In this connection it should be remembered that it was owing in a great measure to the untiring efforts of Maj. Frank B. Granger, M. C., who was Chief of the Reconstruction Service in the Surgeon General's Office, that Physio-therapy was first introduced into the Army rehabilitation work, developed, and became one of the greatest and most successful branches of the entire service. It has almost seemed that the calamity of the great war was necessary in order to startle the medical profession into a realization of the wide field that should be occupied by physical

methods in the treatment of disease. Until the outbreak of the recent war these methods were ignored by far too many physicians and surgeons.

The wounded soldiers were the first patients in the Physio-therapy departments of the military hospitals, and there was probably no branch of the service more appreciated by these wounded men than this department. At first there were very few patients, but as the hospitals began to fill up the department grew larger, equipment more elaborate, and the scope of the work more extended. The wonderful results obtained are now a part of the history of the medical department of the United States Army.

The class of cases treated by the physio-therapy methods embraced mostly gunshot wounds and those from high explosive and shrapnel. Medicine and surgery had done their best for these cases and had passed them on to the Physio-therapy department for what further aid it could render.

Many of the cases were accompanied by such after effects as atrophy and weakness of the muscles, injury to bones and tendons, contractures, scar tissue, ankylosis, limited motion, stiff, swollen, or painful joints, or such injury to the nerves as to cause total or partial paralysis of the parts.

On his admission to the Physio-therapy department, each patient was examined, and the treatment best fitting his case was prescribed by the director or his assistants. The examination was painstaking and thorough. Owing to the nature of the injuries this presented peculiar difficulties. A piece of shell or a bullet in its course through the tissues invariably leaves a condition in which skin, muscles, tendons, nerves, and periosteum are all matted together in one confused mass. Nerve trunks may be simply bruised or entirely destroyed.

It was important in every case to examine the whole of the affected part, arm or leg, from its origin to its extremity, noting the movements which appeared weak, imperfect, or impossible.

The electric diagnosis was an important aid to clinical investigation in cases of nerve injuries, helping to form a prognosis and giving valuable indication as to treatment. The X-ray was also very useful in aiding the diagnosis of bone, joint, and nerve injuries, showing the exact condition and extent of injuries of the part and whether any metallic foreign bodies, such as small pieces of shell, were imbedded in or near an important nerve trunk.

It was found that in most post-operative conditions, the cure should be completed by physical means. It is not enough to break down adhesions, or to restore a muscle, nerve, or joint to potential usefulness. Its nutrition should be improved by electro-therapy, thermo-therapy,

massage, exercise, etc. Also, the patient must be taught to use the part himself. Even if it is possible to move a leg or an arm passively throughout its whole range, the cure is not completed until the patient can do this of his own will. To this end each patient was taken through a course of reeducation of the muscles and joints, beginning with simple single movements and advancing to those more difficult and more complex.

The discharge slip of every patient sent out from the Physio-therapy department invariably bore the statement that his arm, hand, leg, or foot had been greatly improved or practically restored to its normal condition. He was also instructed in special exercises and advised to keep them up in order to reduce to a minimum the chances of the recurrence of his special disability.

The treatment prescribed in the Physio-therapy department in any given case might comprise several or all of its various modalities. A brief description of each follows:

Electro-therapy, treatment by the various forms of electricity, has several distinct objects in view: to produce heat either on the surface or in the tissues themselves, and thus induce hyperaemia and absorption of inflammatory products; to stimulate nerves and so produce muscular contractions; to produce muscular contraction by chemical action upon the muscle tissue itself, which process reeducates and restores the tone of the muscles; to cause absorption of drugs by ionization; and to soothe, alleviate, and relieve pain. In peripheral paralysis, especially in cases of gunshot wounds where there was more or less adhesion and advanced reaction of degeneration, it was found that the best results were obtained by the careful use of the interrupted Galvanic current followed by the slow sinusoidal, as soon as muscular response could be obtained. Also that the slow sinusoidal current with rise and fall of potential was the best method of treating weakened muscles where there were no adhesions.

The treatment room was equipped with all the modern electrical apparatus, including the static, Galvanic, and Faradic, sinusoidal, and high frequency machines, radiant light and heat applicators, ultra violet rays, etc.

The static machine was busy every hour of the day in this electrical room, the currents mostly used being the static wave, the blue pencil brush discharge, and the spray and spark. Hundreds of cases were treated and splendid results were obtained.

After eighteen years of experience in electro-therapy, the writer is not partial to any one particular current or modality. All have their uses and no doubt their abuses. Use was made of them all, some being found best suited for certain types of cases, some for others.

Diathermy, or heat penetration, was used from 200 to 1,500 M. A. or over, in ankylosis or limited motion of joints, according to the size of the joint, and followed by massage and passive exercises. In some cases the best results were obtained from the static wave. In treating neuritis, radiant light and heat were followed in a little while by the Galvanic positive, and in certain cases the Galvanic was followed by diathermy. In extensive scar tissue, diathermy was applied, followed by ionization with the Galvanic negative. Ulcers and open wounds were treated by the ultra violet ray and the blue pencil discharge from the static machine. If one failed, the other would be successful.

Diathermy, or treatment by heat penetration, referred to above, was found to be one of the most efficacious and satisfactory of all the methods used in electro-therapy. It was not only freely used in arthritis and other joint troubles but in a large variety of other pathological conditions, including the nonunion of fractures, the early stages of bronchitis, and pleurisy, and in empyema where there was good drainage, since it does not interfere in the least with the Dakin or any other form of treatment.

Another valuable instrument which was in constant use in the electrical room was the vibrator. Mechanical vibration was found valuable in the treatment of muscular contraction, muscular atrophy, constipation, and also for spinal stimulation in neurasthenic conditions.

Thermo-therapy, the application of radiant light and heat and dry hot air, is one of the most simple and at the same time one of the most useful measures used in the department. Sunlight is recognized as one of the greatest bactericidal agents in nature. Electric light rays, being the nearest substitute for sunlight when applied to the process of metabolism, are recognized as the most vital stimulant among natural forces, their effects being both local and constitutional. The local effect is to increase nutrition by increasing local circulation of the blood in the part to which it is applied. A pronounced hyperaemia is produced, generating heat within the tissues to a considerable depth. When this treatment is followed by massage it enables the operator to stroke and knead and move these parts with greater facility. The constitutional effects are due to the reflex stimulation of the peripheral nerves, and this has a responsive effect upon the spinal centers.

The therapeutic indications for the employment of radiant light and heat were very many. Most gratifying results were observed in a large group of cases, including neuresthenia, neuritis, rheumatism, arthritis, neuralgia, sprains, contusions, dislocations, pleurisy, bronchitis, toxemia, anemias, wounds, post-operative conditions, and local infections. These results were undoubtedly due to the direct bactericidal action of light rays, and the greatly increased leucocytosis

resulting from the active hyperaemia produced. The technique in thermo-therapy is very simple, requiring less training of the assistants than any other method of physical treatment. This invaluable agent should therefore be introduced into general use for the relief of suffering, and it cannot be urged with too much earnestness that thermo-therapy should receive a wide acceptance in general therapeutics.

Hydro-therapy, the application of water in treating disease. There is no remedial agent the scientific use of which demands so thorough-going and practical a knowledge of physiology as does hydro-therapy. Water is without doubt the most ancient of all remedial agents for disease. Not all cases of course are curable, but even in those that are admittedly incurable it is marvelous to note the wonderful degree to which pain and other symptoms may be mitigated by accurately adapted hydriatic prescriptions.

The hydro room was equipped with all the modern hydro-therapy apparatus, including cabinet baths, circular needle spray, the shower and Scotch douche with the Mott (military type) control table, which enabled the operator to control the temperature and pressure of the water at will, the whirlpool arm and leg baths, the sitz bath, the immersion or continuous bath, and the sedative pool. This latter was used in one of the largest army hospitals. The pool was a cement tank, about fourteen feet square, with a stone seat running all the way around so that when the patient was seated the water came up to his neck. The temperature of the water was always kept at 94° F., the temperature of the skin, and was sterilized by being pumped through a tank containing ultraviolet ray tubes. The pool was filled by means of a perforated pipe which ran around the upper edge. Its greatest use was in decreasing nervous irritability of whatever form, and in soothing a disordered heart.

A class of fifteen to twenty patients would be sent over daily from the psychiatry ward for the pool treatment. The so-called "shell-shocked" or nervous and mental cases (always under the careful guard of male attendants), would sit on the stone seat with the fountain spray from the perforated pipe playing over their heads for one hour, after which they were wrapped up and made to rest in bed for another hour. The writer has seen some of the most wonderful cures resulting from this treatment alone in hundreds of seemingly hopeless cases.

Another powerful curative agent was the whirlpool arm and leg bath. The arm or leg is thrust into a vessel especially designed for this purpose, containing water at a temperature of 110 to 115 degrees F. The water is set in motion by an especially made jet or valve which also introduces air, so that the arm or leg is immersed in a hot, swirling,

and bubbling current. The bubbles produce a "watery" massage and increase the stimulant effect on the skin. The length of the treatment is from fifteen to twenty minutes. The soothing warmth of the water changes the cold purple of the painful arm, hand, leg, or foot to a warm red, softening the limb for massage and increasing its conductivity for electricity. The circulation is increased and the pain is relieved. A very important feature of this treatment is the great economy in massage. The duration of massage is reduced from thirty to ten minutes, the actual process is easier and less laborious, while the results are in every way superior to those which could be obtained without it. Hundreds of the wounded men were quite sound except for injury to a leg or arm, and required treatment for that alone. The whirlpool bath proved its value in these cases and was widely used in all the great army hospitals. Its great efficacy was in preparing the part for subsequent treatment by massage, stretching, passive movement, exercises, electricity, etc.

Massage in its many forms was used to dissipate effusions after sprains; to soften, loosen, and stretch contracted scars or adhesions; to prevent atrophy and contractures following nerve injuries and fractures; to increase the range of movements of stiffened joints; and to rehearse the movement of joints where muscles were paralyzed and weakened. Active exercise, both free or with apparatus in the gymnasium, was used for correction and reeducation of weakened muscles and the cultivation of strength and endurance.

Another interesting feature of this department was our measurement room, which was equipped with instruments for accurately measuring the range of motion of all the joints of the body. Each patient was measured once a week and a record or chart of his progress was carefully kept. The periodic measurements served the twofold purpose of encouraging the patient by demonstrating to him in objective fashion that he was improving, and of informing the physio-therapist and surgeon regarding the rate of his improvement.

As previously mentioned, occupational therapy has for its objects restoration of function and mental diversion by means of suitable handicraft. Both the manual work and the educational service, an added feature consisting of regular classroom studies, have a distinct therapeutic value. In furnishing the patient with congenial occupation, they provide an antidote for brooding and self-commiseration, and, by demonstrating to him that he is gradually removing or overcoming his physical disability, and that by his work in the schoolroom and in the shops he becomes more efficient from day to day, they substitute cheerfulness and optimism for a mood of despondency and despair.

No single factor exerts a more powerful influence upon the patient's convalescence and subsequent rehabilitation than the mental attitude of the patient himself. The patient who has abandoned hope and indulges in self-pity and gloomy forebodings has reached a condition which thwarts the best efforts of the surgeon and the educator. Lethargy and hospitalization are the inevitable results; and so long as despondency, pessimism, and instability persist, the case is more or less hopeless. On the other hand, a cheerful optimism on the part of the patient, a spirit of self-reliance and determination to cooperate, are so vitally important as to be indispensable.

The more serious the disability the greater the danger of mental depression and an indisposition to respond to medical and surgical treatment. Therefore, the manual and educational work should begin at the moment when the man has arrived at the stage where he begins to worry about his future. The first problem is to divert his attention by simple recreation, through reading, pictures, games, handiwork occupations, and the like, with a view to securing a genuine interest in the attainment of some worthy end—the end most certain to hold his attention and to claim his efforts in his future vocation. Hence, by gradual steps he may be induced to supplement his previous vocational experience by academic, scientific, or technical instruction, or to choose a new vocation and begin preparation for it, if such a course is necessary.

As the writer has endeavored to show in the foregoing brief outline, the reconstruction service aims at the rehabilitation, both physical and mental, of the individual, and the means it employs to achieve that end are the various applications of Physio-therapy as above enumerated with occupational-therapy.

The specific purpose is to help each patient to function again as a whole man; physically, by helping to restore his body so far as possible to its normal condition; socially, by enabling him to feel that despite his physical handicap he may still be a self-reliant and self-respecting member of the community; educationally, by furnishing him with such a training that he may make the most of his mental and physical resources and increase his personal efficiency; economically, by providing him means of earning a comfortable livelihood, so that on his discharge and return home he may become an economic asset and a useful member of society instead of a liability.

The treatments in the Physio-therapy department, except in the hydro room, as well as the curative and vocational work in the shops and wards, were given by a corps of trained young women, known as reconstruction aides. Many of these splendid young women left comfortable homes and better paying positions in order to serve their country by

entering its service and doing their share in the great emergency. They won the admiration, respect, and appreciation of all who were closely associated with them in this great work.

It is gratifying to know that reconstruction work is at present carried on by the Government in all the United States Public Health Service Hospitals throughout the country, in practically the same manner that it was carried on in the army hospitals during the war, and that it continues to demonstrate its efficiency.



ANAPHYLAXIS AND SERUM SICKNESS—SERUM ALLERGY

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NO EXPERIENCE in the professional life of a physician can be more terrible than his feeling of responsibility and utter helplessness while witnessing the sudden, dramatic, and mysterious phenomena which characterize fatal anaphylactic shock. The fear of such an event has undoubtedly resulted in the withholding of clearly indicated specific treatment. Fortunately, careful research, coupled with clinical experience under controlled conditions, has increased our knowledge to such an extent that certain directions may now be laid down which, if followed faithfully, should make such unfortunate accidents extremely rare, and possibly eliminate them altogether.

The relation between the harm done by delay through fear of anaphylaxis when antitoxin is urgently needed and the real danger of sudden death is so disproportionate that there can be no excuse for hesitation when prompt decision is demanded. In the case of a child with laryngeal diphtheria, for instance, the chances are overwhelmingly in favor of the immediate intravenous injection of 10,000 to 20,000 units of antitoxin. The cases are rare, however, in which such haste is demanded. There is usually time to make an intracutaneous test, even in the course of a severe infection, and in the case of prophylactic injections there is no excuse for its omission. (The emergency injection of wounded soldiers with tetanus antitoxin or anti-gas gangrene serum of course constitutes an exception.)

In any circumstance it is possible to recognize a large proportion of the "bad risks" upon their personal history alone, and with only brief delay specific tests may definitely identify these persons. *There is at present no excuse, therefore, for completely withholding antitoxin or antibacterial serum from any patient who would be specifically benefited by its administration.*

Scepticism has been expressed as to the possibility of successfully desensitizing a patient naturally highly sensitive to horse serum proteins. Rarely, a patient may be found who will not tolerate and cannot be made to tolerate even moderate doses of serum. The intense interest and practical importance of this particular point should lead physicians to study carefully and report accurately any experience with serum injection into hypersensitive patients.

I. HISTORY AND EXAMINATION

(a) Persons known to suffer from any type of protein hypersensitivity, hay fever, food rashes, and *especially asthmatic symptoms when near horses*, should always be tested by the intracutaneous method and desensitized before being injected with antitoxin or serum, except in grave conditions when even one hour's delay might be fatal.

(b) Persons who have previously received antitoxin may be injected subsequently without fear if the injection is made subcutaneously. A preliminary desensitizing dose subcutaneously should be the rule, however, before the administration of serum intravenously or intraspinally.

(c) It is considered that the sudden deaths which have been recorded as following an antitoxin injection "have occurred chiefly and perhaps wholly in cases of *status lymphaticus*" Park (1). This is defined by Osler (2) as "a condition in children of hyperplasia of the lymphatic tissues and of the thymus, in association with a flabby, fat overgrowth of the body and hypoplasia of the heart and blood vessels." This clinical complex should be considered before injection.

II. SPECIFIC TEST FOR HYPERSENSITIVENESS

The test for specific hypersensitivity to horse serum is made by injecting *intradermally* 0.02 c.c. of antitoxin or any therapeutic serum diluted 1-10 with sterile saline—the amount of serum injected is, therefore, 0.002 c.c. The diluted serum should be injected into the right arm and the same amount of sterile physiological saline solution into the left as a control. Observations should be made at frequent intervals for one hour. A wheal will generally develop very quickly about both injections and rapidly disappear—possibly a little less rapidly about the serum—in a patient not hypersensitive. If the patient is hypersensitive, however, a genuine urticarial wheal will begin to develop about the serum injected within about five minutes and increase in size up to that of a half dollar. The wheal in turn is surrounded by a larger area of erythema. Very rarely, in extremely sensitive individuals, the injection of this small amount of serum, 0.002 c.c., has been known to produce general symptoms, flushing of the face, increased rapidity of the heart, and respiratory discomfort.

III. DESENSITIZATION

The importance of desensitization depends, in some measure, on whether the injection is to be made subcutaneously or intramuscularly on the one hand, or intraspinally or intravenously on the other.

a. *Subcutaneous or intramuscular* injections may be given without further delay if the intradermal test is negative.

1. If the patient has received serum before, a preliminary test is scarcely required. Park (3) says, "The fear of repeating a serum injection because of having sensitized the patient is almost wholly groundless. There need be no fear in giving a second intramuscular or subcutaneous injection to any person who has not suffered severely from the first."

2. If the patient is found to be hypersusceptible and the administration of a therapeutic serum seems to be urgently indicated, Coca (4) advises that "test injections should be given at 30-minute intervals by the intramuscular or deep subcutaneous route and the dose should be cautiously increased by not more than 0.1 c.c. at each successive injection, from an initial dose of, at most, 0.1 c.c. until symptoms are exhibited. Thereafter it would seem safe to try half-hourly injections, perhaps, somewhat less than the largest amount that had caused no symptoms, upon the assumption that the development of symptoms is not dependent on the sum of all the doses administered, but upon the amount injected at one time."

b. *Intravenous or intraspinal injections.*

1. Persons not giving a positive intradermal test are believed by Cole (5) to withstand better the large amounts of serum given in pneumonia, for instance, if they receive a desensitizing dose of 0.5 c.c. to 1 c.c. of serum a few hours previously. There are all degrees of sensitiveness and those patients only slightly susceptible may react violently to an intravenous injection of 50 c.c. or more. A preliminary dose of serum subcutaneously seems to desensitize such individuals. The desensitization should not cause such a feeling of safety, however, as to lead to the rapid injection of undiluted serum.

2. Persons giving a positive intradermal test must receive a more cautious and thorough desensitization. Cole (6) advises "injecting small amounts of the serum, at first subcutaneously, beginning with 0.025 c.c. and doubling the dose every half hour until 1 c.c. is given; then injecting 0.1 c.c. intravenously and doubling the dose every half hour until 25 c.c. can be given without untoward reaction. Four hours later 50 c.c. may be given; and finally, after an interval of eight hours, treatment may be continued in the usual manner. Fortunately it is rarely necessary to resort to this tedious procedure."

It has been found necessary at the Rockefeller Hospital to desensitize in this way two or three patients in a series of over 150 cases.

IV. THE SERUM REACTIONS—SERUM ALLERGY

The symptoms exhibited by persons who have died suddenly following an injection of serum are so similar to those shown by guinea pigs in

anaphylactic shock that the two phenomena have been considered identical until recently. Coca (7) has shown that they are essentially different, and demands the retention of the term *anaphylaxis* for those phenomena dependent upon the interaction of antigen and antibody. The serum reactions in man are not the result of immunological processes, as we know them at present, and for this type of phenomena resulting from a hypersensitive condition of the individual, it is proposed that we employ the word *allergy*.

Clinically it is convenient to classify serum reactions into three groups. In order that our discussion of these manifestations may be as little confusing as possible, it seems excusable to retain for the present the terms, possibly erroneous, which have been adopted into the literature and with which everyone is familiar.

a. *Serum disease—Serum sickness*—occurs in from 10 to 60 per cent of persons injected. The size of the dose influences the percentage incidence, a higher proportion would therefore be expected following large intravenous doses than after relatively small subcutaneous amounts. It may be manifested at any time up to about fourteen days after the injection. In persons who have received a previous dose of serum there seems a definite tendency for the urticaria and other symptoms to appear earlier (immediate or accelerated reaction) than after the primary injection.

Symptoms:

1. Fever is not always, although it is frequently, associated with the eruption. It is sometimes considerable, reaching as high as 106°–106.5° F., and may lead to doubt as to whether it is actually due to the serum or to a complication of the disease.

2. Eruptions are local and general. The local eruption occurs about the point of injection and generally appears earlier than the general. Local necrosis (Arthus phenomenon) has been reported. The general eruptions are highly polymorphous, different forms often occurring at the same time—erythematous, intensely itching urticarial, papular or maculopapular, vesicular, and hemorrhagic.

3. Joints. Pain and tenderness in the joints occur in from 1 to 1.9 per cent of injected individuals. Rheumatoid pains in the muscles are sometimes observed.

4. Edema affects most commonly the face, especially the eyelids and dependent parts of the body. Slight albuminuria has been noted.

5. Lymph nodes. A general adenitis occasionally occurs. Somewhat more frequently the regional nodes are enlarged and painful.

b. *Collapse—"Anaphylactic" Reaction*.—In individuals hypersensitive to horse serum there may develop immediately or within 15 to 20

minutes a more or less severe asthmatic attack with dyspnoea and flushing of the face, followed by cyanosis, sweating, cough and general anxiety, and an urticarial eruption. General collapse may, in severe cases, end in death within five minutes.

Following subcutaneous injections, this is a rare accident and its occurrence has been almost always subsequent to the first injection the patient has ever received. The fear of sudden death as a result of previous sensitization is, therefore, almost groundless in so far as subcutaneous injections are concerned; in fact a previous injection without alarming sequelae gives assurance that natural hypersensitiveness does not exist. According to Park and Williams (8) alarming symptoms follow primary injections in about one in 20,000 cases, and death results in about one in 50,000. In one instance, the dose was only about 1 c.c. Kerley (9) has reported a case of known hypersensitiveness in which the dose was gradually increased up to four minims; this amount resulted in alarming shock. Some writers have advised an initial "desensitizing" dose of 0.5 c.c. to 1 c.c. of serum subcutaneously without a preliminary intracutaneous test. In a patient not very sensitive this procedure might seem advantageous, but it should not be considered a substitute for the intracutaneous test for hypersensitiveness made with 0.002 c.c. of serum.

With the full amount of foreign protein coming into immediate relation with the tissues, intravenous injection certainly affords greater opportunity for the occurrence of the side effects of serum therapy than subcutaneous administration with consequent slow absorption. When contemplating the injection of serum into the vein or into the spinal canal there is reason, therefore, to consider seriously the method for determining specific hypersensitiveness and for desensitizing susceptible patients. A hypersensitive person may begin to show signs of collapse during the intravenous injection. In such cases the needle should be immediately withdrawn and proper treatment instituted without delay.

c. *Thermal Reaction*.—This reaction comes on within twenty minutes to one hour, and is characterized by chilly sensations or a general shivering chill, slight difficulty in breathing, and cyanosis. The temperature rises rapidly sometimes to an alarming degree and then falls, the decline being frequently accompanied with profuse perspiration. The administration of cold serum may be a cause of this reaction.

V. TREATMENT OF SERUM REACTIONS

a. *Serum disease—Serum sickness*.—When the urticaria is extensive, pruritus may be a distressing symptom. It may be relieved to some extent by 5 per cent phenol solution or calamine lotion, which the patient himself may apply to the itching areas as desired. At night

the use of epinephrin hypodermically, in doses of 0.6 to 1 c.c., has been found useful. Following the injection the urticaria disappears like magic for a few minutes to a few hours, when it again returns. If one uses epinephrin at night, the patient will often fall asleep as soon as the urticaria disappears and sleep several hours before being disturbed by the itching.

Usually the joint symptoms pass away in a few days, but may last a week. The administration of aspirin or sodium salicylate, 0.3 to 0.6 gm., with sodium bicarbonate, 1 gm. every 4 to 6 hours, usually gives relief. Occasionally the patient complains of a headache, which may persist for several days, but this is usually relieved by aspirin(10).

Collapse—"Anaphylactic" Reaction—unless extremely severe, is usually quickly relieved by the hypodermic injection of 0.6 c.c. of epinephrin (1 to 1,000) solution or 0.5 mgm. (1/100 gr.) of atropin sulphate, or both. In view of the possibility of reaction following large doses of serum, even in persons giving negative intradermal tests, there should always be in readiness the means for the immediate injection of these solutions.

Thermal reactions require little treatment. The application of heat to the extremities and warm drinks are usually sufficient.

VI. SUMMARY

The following "rules" may be formulated for guidance in the administration of antitoxins and serums, having chiefly in mind the avoidance of reactions. (It is to be remembered that in the course of treatment of a particular case desensitization is required only with regard to the initial injection.)

Ascertain, if possible, whether or not the patient—

1. Shows any symptom resembling asthma when in the neighborhood of horses; has hay fever or any other form of protein allergy.

2. Has previously been injected with any form of horse serum.

Inject intradermally, with saline control, 0.002 c.c. of the kind of serum or antitoxin it is desired to administer.

If the injection is to be made

1. *Subcutaneously or intramuscularly*—

- (a) If delay of one hour might be fatal, inject the proper dose immediately.

- (b) If there is a history of previous injection and delay seems inadvisable, inject the proper dose immediately.

- (c) If there is time, and there nearly always will be, consider the history and make an intracutaneous test. With these negative, proceed.

- (d) If there is a history of horse asthma, proceed by the desensitizing

method of Coca (page 513, paragraph III 2), even if the intracutaneous test should happen to be negative.

(e) If there is a history of other forms of hypersensitiveness, but not horse asthma, depend upon the result of the intracutaneous test.

(f) If the intracutaneous test is positive, proceed by the desensitizing method of Coca (page 513, paragraph III 2).

2. *Intravenously*—

(a) Always see that the temperature of the serum is between 96° and 104° F. Never inject cold serum, and remember that the serum does not become warm as soon as its containers are placed in warm water.

(b) Always inject the serum slowly, and for intravenous use, when possible, dilute it with sterile saline made from freshly distilled water up to about 200 c.c.

(c) Have in readiness for instant use syringes containing epinephrin and atropin solutions.

(d) If, in a rare instance, delay of one hour might be fatal and

i. No history is obtainable, proceed with the injection cautiously, dilute the first 10 c.c. about 1-10 (i.e., up to 100 c.c.) with sterile physiological saline solution and inject very slowly.

ii. There is a history of protein allergy, and especially of horse asthma, consider very seriously the possible benefit that may be derived from the serum, the actual danger of sufficient delay to make an intracutaneous test, and the harm that may be done if the patient is actually hypersensitive. If it is decided that the best will be done for the patient (in laryngeal diphtheria, for instance) by proceeding with the injection, dilute the first 10 c.c. and inject very slowly as noted in the preceding paragraph (di).

iii. There is a history of previous injection and positive knowledge of no form of allergy, proceed as in the paragraph above (di).

(e) If there is time, obtain what history it is possible to elicit, and make an intracutaneous test, using preferably some of the same serum it is intended to inject.

i. Positive evidence of horse asthma and a positive intracutaneous test are danger signals of almost coordinate value; with either or both proceed by the gradual method of Cole as noted in paragraph b2 on page 513.

ii. Positive evidence of other forms of protein allergy but not horse asthma or a history of previous injection, and a negative intracutaneous test, give the single subcutaneous desensitizing dose recommended by Cole and inject as directed in paragraph b1 on page 513.

iii. With history negative, or if none is obtainable, and intracutaneous test negative, desensitize and inject.

3. *Intraspinally*—

(a) In the literature there are references to the occurrence of collapse in the course of the intraspinal administration of serums. We have not found, however, any record of systematic attempts to prevent or control these reactions such as Cole and his coworkers have made in the case of intravenous treatment. The usual subcutaneous and intravenous methods would probably not desensitize the intraspinal tissues. The following directions are scarcely more than suggestions, therefore, and officers are urged to report carefully any experiences they may have in the intraspinal treatment of allergic individuals. If the delay is inadvisable and

i. No history is obtainable, proceed with the injection.

ii. There is a history of protein allergy, attempt local desensitization by the intraspinal administration of highly diluted serum (at least 1-10 with saline); permit about 10 c.c. to run in and out again almost immediately. Repeat the injection of diluted serum in 15 minutes and permit this to remain in the canal with the needle in place for 15 minutes, then let it run out and give the full dose of serum very slowly. Permit the needle to remain in place about 10 minutes more. If any symptoms of collapse appear, remove the fluid immediately.

iii. There is a history of previous injection, by any route, proceed with the injection.

(b) If it is possible to delay for one hour, make an intracutaneous test; if this is

i. Negative, and there is no clear history of protein allergy, proceed with the treatment.

ii. Positive, or if there is a clear history of horse asthma, attempt local desensitization as noted above, together with the subcutaneous method advised by Coca.

VII. BRIEFLY

1. If the case demands immediate treatment, proceed.

2. If delay of one hour is possible, as it nearly always is, make an intracutaneous test.

3. If this is positive, desensitize and inject slowly.

4. If there is a history of horse asthma, proceed with caution.

5. If the history and intracutaneous test are negative, give the subcutaneous treatment immediately; if injection is to be made intravenously, give immediately a subcutaneous dose of 1 c.c. and the entire treatment when arrangements are completed.

6. In the same case, desensitization is not required for subsequent doses of serum injected within a week.

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MALINGERING AND SIMULATION OF DISEASE IN WARFARE¹

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A CHIEF task of the army neurologist in war time is to detect malingerers and simulators as well as those who imagine they are hurt or sick, and those who are beset by apprehension of disease. As a psychiatrist he knows that man in the mass is a weak creature of suggestion and ready to avail himself of any excuse to avoid difficult obligations; but he also knows that this very weakness of humanity may be utilized to make a man by example, suggestion, or persuasion, brave, devoted to his duty, willing to fight and even to die for his country. As a student of the humanities, he knows that this suggestion was performed in their warlike days by the ancient Greeks, the Romans, the Mahometans, and the Zulus. Furthermore, he knows that humanity has not changed, for he has seen the same marvel accomplished by the French. Thus he is ready to do his part to attain this end for his own country.

As a physician he knows that the detection of an evasion of duty is only the beginning of his task. He should know that a man interested only in diagnosis, or who has exclusively what is mistakenly called a scientific interest in his profession, has no place in an army at war. He knows that his own duty is not only to detect, but to bring to bear his knowledge to compel a change of heart in the man he has found trying to deceive in order to escape his plain, essential obligation as a citizen of a free state.

The neurologist who understands his profession knows that there is no essential difference between an attempt at self-mutilation, of which even the laity can comprehend the motive, and the complicated form of malingering concealed in the ramifications of a psychoneurotic state. His knowledge and psychological skill prevent him from accepting at face value all the psychopathological phenomena which are presented to him. The Army neurologist must have an insight too keen to be befogged by the plausibilities of a mass of nebulous psychopathological theories in which vastness assumes the guise of profundity, and of which the intrications appear necessarily scientific only to the uncritical. His mind is too practical to allow academical artificialities to smother his true objective, namely, the rapid return of his patients to effective duty. His morality is too broad to allow him to be influenced by pharisaical bigotry with reference to the culpability of the patient before him.

Irrespective of the genesis and mechanism of the patient's complaint,

¹ Selected from a report upon war neuropsychiatry made for the A. E. F. while serving as adviser in neurology and psychiatry to the American Red Cross in France.

the true psychotherapist makes it his business to remove from the subject's mind the false attitude it has adopted. He tries to replace the false with a true sense of obligation towards his fellows; but when he cannot do this he is supple enough to be content to appeal to his patient upon other less altruistic grounds, and to imbue him with a feeling of respect for, and the imperative necessity of, conforming to the desires of those whose sense of duty has led them to sacrifice immediate personal comfort and advantage for the good of the cause.

OPPOSING DOCTRINES

Two contrasting opinions stand forth conspicuously when malingering and simulation are in question. One of these is that of a good many military doctors without psychiatric training who consider that every symptom for which they can find no grave physical signs is due to simulation, and that on principle every soldier should be suspected of malingering unless he can prove the contrary. The other opinion is that every simulator is proved by that very fact to be abnormal mentally, and that if he has not already manifested a distinct psychosis, it is only a matter of time before he will do so, and that he should be interned rather than punished. I have stated the extreme of these opinions in order that the reader may the more readily be struck with the absurdity of each of them. Now, as a matter of fact, it must be remembered that the psychiatrist sees almost exclusively those malingerers in whom there is already a suspicion of mental disorder, and that he fails entirely to see the vastly larger number of malingerers of whom there is no question of mental disturbance, and who are punished quickly and return to duty thereafter usually without further manifestation, and continue to live normally for the rest of their days.

As a matter of fact, malingering is a perfectly normal reaction of simple-minded persons, and is almost universal in young children, given circumstances which permit it, i.e., provided that the idea of it is brought to the attention. Whereupon by direct imitation or by inductive reflection concerning illnesses observed, the malingerer fabricates a syndrome in which he attempts to make others believe, and indeed often succeeds in believing himself, more especially if he has retained the high suggestibility of the normal child. Furthermore, malingering is even more often a mere continuance of the complaint of a sickness which has in reality ceased, a profession being maintained for the comfort or justification derived therefrom. The patient finds that his lot is softened.

Now, this is not a mark of disease unless we so call the human desire for comfort, sympathy, and protection from danger. As a matter of

fact, this is the mechanism at the root of the symptom known in the Army under the name of perseveration, which was especially conspicuous during the recent War. To call all such cases unsound of mind and to condone their resistance would be a travesty of psychiatry and a forensic stupidity which would quickly demoralize any army, or for that matter any society. For although the strict determinist may argue, with justice, that no one is to blame for any act whatever because all our acts are determined by circumstances, yet the practical sociologist, lawmaker, the upholder of order, any man of common sense, has found that in practice one of the most powerful determinants of social amenability is the deterrent to antisocial impulses provided by the fear of punishment, based upon the premise that each citizen is regarded as capable of controlling his acts so as to avoid injury to his neighbor.

When an individual has not developed mentally to the point where he appreciates the advantages of behavior which adds good to the community, to condone the means he used to avoid his responsibility by malingering, and to attribute his behavior to a psychological incapacity is only to add to his motive the very justification which he seeks, to tempt him to further infractions and to furnish an exceedingly injurious example to others at a similar developmental stage. The argument that such persons are irresponsible on account of their mental inadequacy is completely refuted by the effects upon these persons of the fear of punishment, which is capable of immediately cutting short their antisocial attempts to evade their obligation.

Such malingerers usually show such an insight into the advantage of avoiding punishment that once they are convinced that their dodge has been discovered they are only too glad to avail themselves of any loophole offered by the psychiatrist, so that they may return to their corps without the stigma of malingering having been placed upon them by him. It has the same effect as has a suspended sentence after a first offense and provides a strong incentive to future good behavior. In short, if a person finds that he avoids unpleasantness more readily by malingering, it is natural for him to mangle, and he will continue to do so in the care of a credulous observer, anxious to find excuses for him. But if the malingerer finds the observer sceptical and stronghanded, he soon realizes that malingering "does not pay," whereupon he adopts the natural course of changing his tune, and resumes his obligations, grudgingly or willingly, according to his temperament.

MYTHOMANIACS

But besides those who are inaccessible on account of their psychopathic inadequacies, there is another class of simulators who are pathological although not certifiable lunatics. These are the mythomaniacs,

as Dupré has called them. Their whole life is a kaleidoscopic series of simulations usually lacking in consecutivity, purpose, or system, but occasionally becoming fixed in a unified end. They are the pathological liars. They usually perform merely for their own amusement and sometimes even from indifference. They are so careless and inexact about what happens that it seems to them of no importance whether statements are true or not. As they are persons who have never learned to control impulses, that have never developed any principles of conduct, they are very difficult to deal with, as ethical motives make no appeal to them, and some of them are incapable of making a continued effort even to avoid impending unpleasantness or even serious punishment. The mental process which occurs may be compared to that of the dipsomaniac, in that the imperious craving finds no deterrent in the knowledge of the inevitable consequences, however serious these are known to be. It is easy to call these persons moral imbeciles, but this does not explain the mechanism of their mentality.

GENESIS

This may often be found in the environmental conditions of their childhood. After all, their character is only an exaggeration of tendencies present in everyone, and more or less manifested in the deplorable commercial atmosphere of many large centers of population, where the highest criterion of principle is the capacity to "get away with it," as it is expressed.

A CASE OF SIMULATION

Wounded 1914. Left projectile in head. Hemiplegia. Taken prisoner and returned as incurable by the Germans. He often complains of headache. He has a severe pain inside foot and leg, then mounting trunk and arm up to the ear—no higher. It is continuous, with exacerbations. There is also complaint of pain around the head wound. There is complaint of slight dizziness, but he never falls.

The reflexes are slightly increased on the right, but there is no extension of the toes on stroking the sole. In the contralateral synergic test he cooperates badly. His right leg trembles when he is watched. The abdominal reflexes are equal. He walks on the end of his right toes, jerking the limb foolishly. He shows the Raimist wrist sign, which disappears when his attention is distracted. He is, however, very watchful, as he has been examined frequently by neurologists. He received no benefit either at the Maison Blanche or the Salpêtrière. He has learned to make his arms tremble, and to show a poor diadokokinesis. The tremor was arrested by the maneuver of suddenly making him touch his nose with both hands at once, while his eyes were closed. There is, however, a widening of the palpebral fissure.

In the induction of the mythomaniac syndrome for the common motive of vanity in civil life is substituted in warfare the more fundamental one of self-preservation. The desire for a "Blighty one" becomes very strong in certain temperaments. It is only the difficulty of doing so severely enough and in a likely way, and the fear of being found out that prevents these men from mutilating themselves to escape danger. The degree to which such motives can lead men even in peace is familiar to all medico-legal experts. But a man of this sort receives a certain esthetic pleasure from his conduct. It would not be too unreal to call it artistic in mythomaniac of action. Even when no pleasure is received, desire for escape may produce a strong enough motive which preponderates against the most cruel moral suffering.

THE STATEMENT OF A CURED MYTHOMANIAC, ILLUSTRATING THE
CONDITION IN CHILDHOOD

I entered school when I was five years old. Shortly before that, and for perhaps a year and a half after, my aunt and mother tried to inculcate in me a respect for truth which they felt I lacked. I was repeatedly corrected for misstating things, the misstatement being purely unconscious on my part. I did not distinguish clearly between what I imagined and what actually happened. To illustrate:

One icy morning I saw the Governor of Vermont going past our home carrying an ax in his hand. I immediately pictured him in my mind as falling on the ax. The image was so clear that not long after I told my mother that the Governor had fallen on the ax and hurt himself. My mother inquired of his family concerning the accident. When reprimanded I still felt that he had fallen on the ax, but that for some reason he did not wish to have it known.

I frequently believed people had said what I felt they thought. I startled my mother by quoting to her what friends of hers had said. She knew that they had not said the things in question, but was equally confident that they had thought them. The only illustration which I remember is this:

I was playing alone and began to cry. My mother asked me what the matter was and I said that two little friends of mine had said that I could not sing and therefore could not take part in a cantata which local talent was to give. (The name of the cantata was "Mystic Midgets.") Mother spoke to the girls about it and they denied saying it. My cousin asked them if they had not thought so and one of them admitted that she had thought so.

This patient when aged nine, realizing her fault, set about reforming herself, and succeeded in doing so after years of struggle. She now

occupies a situation of trust, and although of seclusive temperament, is not mythomaniac at all.

According to Dupré, pathological mythomania often leads to vicious tendencies, or to instinctive perversions. It is a particular form of intellectual activity guided by pathological sentiments. It is no longer a game, but a particularly dangerous weapon, so much the more so if the psychopath is intelligent.

Normal mythomania appears to have a cause, a motive, and is proportioned to it, whereas abnormal mythomania seems insufficiently or not motivated at all, its duration is persistent, and its intensity is out of proportion to its cause.

There are different degrees of mythomania—from simple alterations of truth to simulation, fantastic fabulation.

In abnormal children as well as in grown-up psychopaths three kinds of mythomania are to be differentiated: *vain*, *malicious*, and *perverse*.

1. *Mythomania Caused by Vanity*.—All weak beings are more or less vain, a morbid desire for glory, an instinctive need of being spoken of, of acting a part, of being "somebody," drives them to lies and fabulation.

All children are vain, and weak children are particularly so. Most interesting is the case of the twelve-year-old girl who came into school one day and said her mother was ill; every day she gave fresh details on the illness and its progress. She said, at last, her mother was dead. She stayed away one or two days, and came back crying and dressed in black and gave details on the mother's burial. Some time after she explained her father had married again and gave new details on the wedding ceremony. It appeared unexpectedly that the child's mother was living, had been ill, and lived with her husband. Inquiry proved that the child had only wanted to be noticed, and wished to wear a black dress that had been promised her for her birthday.

Very striking is the case of a young man who said he had killed his sister by filling her room with carbonic oxide gas he had himself prepared in a neighboring room; he was exceedingly proud of the fact and gave long explanations on the way he had prepared the gas. Nobody believed him, for his sister was known to have died after a long illness. He at last acknowledged that all he had said was false.

Mythomania caused by vanity will drive certain individuals to auto-mutilations; such was a young girl who said she had been assailed in a train compartment, and proved what she said to be true by showing a small wound on her chest. Inquiry proved her story untrue and that she herself had bought, a month before, the knife she had been wounded with.

Varieties of mythomania caused by vanity manifest themselves by

simulation of crime, of disease, of exterior lesions, and of organic perturbations.

X was most surprised and disturbed one night when coming home on finding his wife apparently senseless in a chair, and her throat strangled with a string.

Everything in the room had been disturbed. He called for help, and the victim, on coming to, said she had been assailed by two masked men who had taken her keys from her and had left her after having stolen two thousand francs and valuable jewels in her desk. Inquiry proved everything to be false and some days later Mme. X owned she had simulated a crime for reasons she could not account for.

Simulation of disease may cause serious errors: A man pretends he suffers from tuberculous peritonitis and shows signs of great pain till at last a surgeon is induced to operate. Two more surgeons are afterwards induced to do the same, till at last he is found to be a simulator who only wants to be an interesting case.

N has himself carried to a hospital and says he has been run over by a carriage, goes into the smallest details concerning the accident, says he has vomited blood, etc. He undergoes an operation and apparently recovers health.

No accident had befallen him and all was fabulation, as the inquiry proved.

2. *Malicious mythomania* is associated with the various forms of destructive instinct, from simple malice to the most atrocious ferocity, to all kinds of mystifications, to slanderous hetero-accusations, such as the case of a nineteen-year-old weak-minded, hysteric girl who told the magistrate about three persons who had drowned a man. These three persons were condemned to imprisonment, but soon had to be released, for nothing proved to be true. The girl then said her own father had drowned the man. The drama ended by a convulsive hysteric attack.

The well-known case of Lieutenant R., who was charged by Mlle. M. for having attempted rape and was condemned to ten years' imprisonment, which he effectually underwent, is a most demonstrative instance.

Attempts at rape with serious violence are as a rule the theme of these false hetero-accusations.

3. *Perverse Mythomania*.—Psychopaths are led to perverse mythomania for the sake of satisfying their vicious tendencies. Often, in these cases, the three kinds of mythomania are combined (vain, malicious, and perverse).

The case of Therèse Humbert is most interesting and shows what an intelligent and clever mythomaniac can realize by fabulation. In this extraordinary case, the highest and cleverest classes of society were com-

pletely imposed upon by the effects of an extensive but really absurd suggestion emanating from weak-minded Therèse, who was gifted with the particular qualities of an active mythomaniac and with remarkable creative power. The result was that she realized a fortune by a clever fabulation. Of a similar nature was the Reynolds case which victimized Mr. Carnegie and other financiers.

It is necessary to remember that fabulation may have its foundation in what is or what appears to be true. There is often a groundwork of fact. Also the mythomaniac's appearance of truthfulness and of conviction and the surprising logical conformity between his words and his acts and minute account of details win the confidence of on-lookers, and the most sceptical are forced into belief. An atmosphere of suggestion is created, emanating from the psychopath himself. He, himself, by a phenomenon of auto-suggestion, believes everything he has invented, and thus is erected a monument of lies and errors which is the work of a collectivity and belongs to the social facts which Tarde wishes to be studied under the name of "Interpsychology."

Mythopathic activity is often unconscious and involuntary, but often also works with the help of conscience and will, especially at the beginning of the fabulation.

These factors disappear progressively without there being any change in the evolution and consequences of the morbid process. Suggestion must not be neglected in this study, as it plays a most active part with children and psychopaths.

These weak-minded, degenerated individuals have often a mental inertness, a laziness of will, which leads them to follow what is suggested; timidity and vanity both often entail suggestibility.

It is hardly necessary, after what has been stated, to draw attention to the importance of mythomania from a legal and medicolegal point of view.

These most demonstrative examples show clearly enough the dangerous consequences of mythomania, and the serious errors it leads to, with miscarriage of justice, such as condemnation of innocent persons to imprisonment, or even worse.

SIMULATORS OF DEAF-MUTISM (SICARD)

Certain subjects pass rapidly from suggestion to simulation, and inversely. The psychopathic process may thus develop: commotion, emotion, suggestion, exaggeration, simulation, *revendication*, i.e., a sense of being aggrieved, with claims based thereon.

This evolution, which is seen in victims of accidents in civil life, is also found in those injured in war. (See my "Traumatic Neurosis," *Journal of Criminal Law*, 1916, etc.)

The liar often ends by believing his own lies. A subject who at first simulates a contracture or paralysis with the intention of deceiving others may at length become the victim of his own trickery. Accordingly it is well, from a therapeutic point of view, to act quickly and energetically.

According to Babinski it is not so much a question as to whether the subject is sincere or not, but of ridding him of his disorder as soon as possible. He declares that if one proceeds with energy and knows how to gain sufficient authority over the more or less conscious simulators, the result can be attained even in accidents of long standing. This I can confirm in civil practice.

Déjérine, on the contrary, declared that these functional disorders are due to emotion, and that the subjects present the same mental state as those suffering from traumatic neurasthenia. But see my recent articles on "Genesis of Emotive States," *J. A. M. A.*, August, 1920; *Medical Record*, March 8, 1921.

The special group of nervous and hysterical cases includes: astasia, abasia, paraplegia, hemiplegia, convulsions with crises at shorter or longer intervals, rhythmic myoclonias, blindness, deaf-mutism, abdominal meteorism, certain plicatures of the spine, eructations, and alimentary regurgitations.

It is a curious fact that in spite of being in the same ward, these neuropaths do not add to the neurosis that of others. It is generally as a result of accidents caused by bombardment that these neurotic disorders develop. But, in general, psychic reaction at first is in inverse ratio to gravity of injury. Wounds which necessitate the amputation of a limb cause less neurosis. Here, as in accidents in civil life, rapid definite solutions which do not lend themselves to any contest as to the degree of the gravity of the injury, are those most opposed to any outbreak of neuropathy.

On the contrary, it is usually among the slightly wounded, above all among the "commotionnés" without exterior wound, that psychoneuroses most easily appear. This is only during the first few months, and not always then. Later, mutilations are frequently complicated by neurotic attitudes both of body and mind, which seriously incapacitate the victim, from a purely psychological reason. Inertia, desire for indemnity, and search for sympathy are the chief motives. See my "Psychic Effects of Accidents," *New York Medical Journal*, January, 1912.

The period of return from the front is propitious, in the bad sense of the word, to suggestive meditation. The psychism becomes absorbed in the chance of present or future disease, and the solicitude of those about them often contributes to perpetuate this way of looking at themselves.

Nurses and other attendants must be taught to understand, so as to prevent the memory of past dangers or loss of comrades being kept alive by the family circle, with its apprehensions and fears for the future. For the self-deceived limit is easily passed, and the psychopath fixes his reaction often more consciously than unconsciously, and so sets his feet on the road which leads to simulation.

There are two groups of simulators: *Creative simulators*, viz: those who seek to realize by using their imagination, attitudes, movements, or sensory difficulties calculated to awaken pity.

Fixative simulators are those who, having really suffered from a nervous lesion, and perceiving an amelioration, exploit and perpetuate their symptoms. They try to retain their symptoms.

A creative simulator of deaf-mutism is more easy to expose than a fixative simulator, for he has had to learn and keep up a difficult rôle for which he was not prepared.

The fixative simulator, on the contrary, has already been educated involuntarily. He has become acquainted with the symptoms of deaf-mutism in spite of himself. He has been a real deaf-mute for several hours, days, or perhaps weeks. He has really suffered from sensorial and intellectual obnubilation, knows, therefore, how it feels, which is an appropriate mode of behavior.

Doctors who themselves have experienced them bear witness to the nature of these post-commotional states. But the day that the psychoneurotic takes advantage of this lesson, learned accidentally and compulsorily, and refuses to be cured, he becomes a fixative simulator. He is already in full possession of his rôle in which he has acquired a mastery calculated to deceive the spectator.

In order to carry on the deception to the end, these men must have great energy. Although they feel they have entered on a deplorable way, their *amour-propre* and their pride or vanity will not allow them to yield. Sometimes the double rôle of deafness and mutism is too much for them, then, invariably, the patient admits that he hears again, but the mouth remains mute.

One of them, a very intelligent fellow who, for seven months, had not uttered a word in public, told us, after his avowal, that at certain moments he had been haunted with the fear that he might really lose his voice or even his hearing, and that, terrified at this thought, he would go into the dark passages of the hospital, in the evening, in order to murmur over to himself numbers and words.

The anguish these men undergo is only revealed after they confess. The lot of these deaf-mute simulators is pitiable; always on the *qui vive*, living in fear of a movement of surprise, a significant turning of the head, a possible start at an unusual noise, a too expressive look, of think-

ing aloud, they isolate themselves, stay in bed, and instead of playing games, they sit immovable and with a fixed look. The repetition of the same movement, the winking of the eyelids, the tic of the muscles, the biting of the lips are the subterfuges they make use of, not only to create a mask, but in order to pass the time and to give themselves new energy.

The pulse is often rapid (90 to 100 beats). Their hands tremble, sometimes even their whole body. They grow thin, lose their appetite, and perspire easily.

If one asks one of them to show his tongue, the answer is almost always the same; he opens his mouth and points to his tongue, which remains glued to the lower part of the mouth. When they want to cough they make a peculiar clucking or a smothered, drawn-out sound.

They leave nothing to chance. Every one they encounter has to be convinced of the reality of their deaf-mutism. Even the letters they received show that this end has been attained.

Two deaf-mutes suspected of simulation were watched during their outings by detectives, whereupon they confessed later. Although one was never able to detect them in the slightest hesitation of manner or manifestation of suspicion, having become exhausted by being constantly spied upon, which weighed still more heavily upon them outside the hospital than in its walls, they had to yield to the ordeal.

Phenomena Following Confession.—The avowal is followed by an immediate physical relaxation. The transformation is rapid. The features get back their expression, the pulse recovers its rhythm, the appetite improves. They have regained their place in society.

Every subject who, without any objective verifiable disorder of the nervous centers or of the organs of hearing and speech and without a characterized psychosis, *remains completely deaf and dumb* for three or four months, may almost *certainly be considered a malingerer*.

This term, "Complete total deaf-mutism," is used advisedly. Out of seventeen cases of complete deaf-mutism observed and attended in one "service" during three months, nine subjects confessed their simulation.

In six cases the fraud was discovered by the gentle method which consists in sparing the self-respect of the subjects, avoiding all reproach, all criticism in the ward and, above all, the accusation of simulation before a witness. They are taken aside and made to understand the infamy of their conduct. They are appealed to on the grounds of patriotism, of their conscience, and they are given a physical or electrical treatment which *serves as a pretext* for their rapid cure.

In this way from some, at least, proof of remorse and regret for their behavior has been proffered. These men have been sent back to the Army.

Some of them have written their views, which shows that they bear themselves courageously in the front line.

The following anecdote will illustrate the methods of some simulators.

Having seen the futility of continuing his trickery, Private S. one morning asked leave to go out in the afternoon, saying that he was about to be cured. Now, what was the astonishment of every one a few hours later, on reading the following in the evening paper:

Real Miracle. At two o'clock this afternoon, when walking about the Boulevard de la Liberté, a soldier fell down in a fit. The passers by ran to his assistance and when he came to himself he manifested the greatest joy that the shock had restored his speech and his hearing, which he had lost by the explosion of a bomb, in Alsace, last August. The accident of today has given him back both his speech and hearing. We most sincerely congratulate him and those who ran to his assistance. This courageous soldier is delighted at this unexpected result. He is all the more pleased to have recovered his health, he says, as he will now be able to take his place beside his comrades fighting against the "Boches."

For eight months S. had not uttered a word, most obdurate malingering. Some time after this recovery, so cleverly dramatized, he wrote a letter which is quoted in full:

My benefactor, I thank you most heartily for what the doctor has done to save me from court-martial. I do not deserve it, but I shall do all I can to atone for my conduct, etc.

That he kept his word a sergeant of his regiment later gave assurance in most eulogistic terms.

But other simulators, usually those of *fixation*, remain obstinate. All persuasion addressed to their good will, their moral sense, is in vain. If determinedly applied to these men, intensive faradisation will, however, succeed. If it cannot be properly applied, however, there is nothing for them but the recourse of threatening them with court-martial or even of sending them to be tried.

If possible, the ears should first be tested and the cerebrospinal fluid examined, but it is rare to find a subject who will allow this to be done. Neither will they submit to be anesthetized.

MANAGEMENT OF MALINGERERS

It is to be remembered, however, that there is a very strong temptation for a patient who is really suffering to exaggerate his symptoms if he is the least suspicious that the doctor is going to regard them too lightly. This is particularly true in cases of sciatica, neuralgia, or lumbago. This tendency of the patient makes the examiner's task sometimes very difficult, as he is in danger of falling into the mistake that the patient has nothing at all because so many of the symptoms

he presents can be shown to be simulated. The best way to prevent this tendency of patients is to obtain the reputation of honestly considering each case on its merits and to avoid the reputation of being too ready to minimize the man's complaints. Some neurologists adopt the plan of permitting other patients to witness each examination. In this way the men become impressed with the thoroughness of the doctor's examination, and with the fact that he does not ignore legitimate complaints. As soon as the men understand this, they are deprived of their chief motive for exaggeration of symptoms, unless it is a case of out and out malingering. The case which is so difficult is when exaggeration or simulation is only an addition to real symptoms.

SIMULATED PAIN

The greatest difficulty is as regards pain complained of, for here the task becomes one of proving a negative; manifestly impossible. So that we must have recourse to inferential probability. However, most malingerers complain not only of pain, but of tenderness on pressure. It is here that they place themselves in danger of being caught, for the observer can so vary the location and nature of the pressure without the knowledge of the patient that it is generally easy to show the inconsistency of a complaint without focal basis. Furthermore, local tenderness causes inhibition of movement of the part, which remains fixed in one attitude. The result is that there are modifications in the skin folds which can be detected upon inspection, and sometimes one can observe, with the radioscope, modifications of the joint surface. If these tests are negative, local or general anesthesia will show whether there are fibrous or tendinous retractions. In some cases electrical stimulation will demonstrate this. In all of these cases we would infer that we are not dealing with a complete malingerer.

The most difficult situation to adjudicate is that of pain in the back, whether it is from an alleged injury or simply lumbago. In the former case there should always be a point of maximum tenderness which is aggravated not only by pressure, but when the patient straightens the back after stooping. In lumbago, tenderness is either absent or diffuse, and the pain is aggravated only when the patient contracts the muscles and not as a rule on passive movements of the spine by the examiner.

COMPLAINTS OF WEAKNESS

In complaints of loss of power, malingering is easier to detect than where pain is the issue. In this case, however, the difficulty lies in distinguishing between deliberate simulation and the affectation of incapacity on account of an honest notion gained by suggestion or imagination. It is usually easy, by means of suggestion or distraction, to surprise the patient into making any movements the examiner de-

sires. The genuine hysteric will thereupon continue to perform these movements when requested; the deliberate malingerer will cease to move the part as soon as he realizes what has happened. See "Traumatic Neurosis," *J. Crim. Law*, 1916, where the Hill case is described.

LEGAL AND MORAL RESPONSIBILITY OF MALINGERERS

There is great diversity of opinion among psychiatrists regarding the psychopathic nature of simulation. There has been an excessive attempt, more particularly in France and latterly in America, to remove responsibility from simulators, more especially when these are criminals. In England perhaps the other extreme has been the rule, namely, to punish criminals without reference to their mental condition unless this is glaringly disordered. Again, some psychiatrists think that malingering is a sign of a feeble mental state, whereas Jendrassik insists that the malingerer is nearly always better endowed mentally than the hysteric, i.e., that in order to simulate a disease, it is necessary to possess an associational system of considerable complexity, which the hysteric lacks.

There are those who declare that the more experienced is the observer in the study of mental abnormalities and of the insane the less inclined is he to give a diagnosis of malingering. But with reference to this, one must remember the unfortunate tendency of alienists to find everyone abnormal and to excuse the behavior of everyone they examine on the ground of the deviation which they always find. If this doctrine were carried out to its logical conclusion there would be an entire end to social responsibility, for no one is free from mental peculiarities.

PREVENTION

As a matter of wise policy, however, it is all the more imperative that those whose psychological tendencies do not enable them to control themselves by motives emanating from within should be provided with strong motives from without to comport themselves as decent members of society. Thus, in practice, it is the very persons who are the least responsible because they have the least self-control whom it is most dangerous to society to relieve of the fear of the punishment which impends when they break laws.

These considerations are just as true in civil life as they are in the Army.

At the same time, it must not be forgotten that there is a degree of defective function which renders it impossible for an individual to respond to continuous stimuli from without, however powerful. Men who reach this degree of neurological deficiency must, of course, be removed from the ranks for treatment.

POSTING AND REPORTING WATER SUPPLIES¹

By EMERY J. THERIAULT

Captain, Sanitary Corps, United States Army

THE methods adopted by the Water Supply Service for the collection of information pertaining to water supplies have been described in other chapters. It is the purpose of this chapter to outline the manner in which this information was made available for the use of Medical Officers and brought to the attention of the enlisted men under their charge. In this connection the measures found suitable for putting into effect recommendations destined to improve the quality of water supplies in Training or Rest Areas will also be considered.

In practically all cases it was possible to make a sanitary survey of the water supplies before the arrival of troops. Field notes were made on standard forms and reports worked up from these forms on returning to the laboratory. Water points were placarded before leaving the area, in accordance with the findings of the sanitary survey or the results of bacteriological examinations. A record was kept of the number, location, and character of the placards for inclusion in the report. The standard form of report was found quite satisfactory both for field notes and finished reports. It was sufficiently elastic to meet all conditions encountered and by expanding on the headings could be used for large towns or cities. In most cases it was possible to present in a one-page report all the essential data pertaining to the water supplies of a town. For convenience the reports on a given area were arranged alphabetically and a short summary was included. Three copies of the combined reports were placed in the hands of the Zone Major or billeting officer of the area. One copy was to be distributed among the dossiers of the various towns under his jurisdiction; a second copy was to be placed in the hands of the Division Surgeon whenever a division moved into the area; the third copy was to be retained by him for file and for the information of advance parties. On the arrival of troops in an area all necessary information concerning the water supplies was immediately available without the delay involved in calling up the laboratory. The placards furnished the enlisted men an official statement as to the quality of the water supplies during the first few days after their arrival and before routine methods of control or inspection could be established.

It might appear that these measures were quite sufficient; in practice, however, they constituted but a small part of the work. It was neces-

¹ This paper was prepared for incorporation in the volume dealing with water supplies to constitute part of the History of the Medical Department in the World War.

sary to supplement the written reports by personal contact with the Medical Officers, and, furthermore, to ensure that the recommendations made in the reports were carried out, it was necessary in many instances to give personal instructions and practical demonstrations to the enlisted personnel.

As soon, therefore, as it could be ascertained that a division was moving into an area, the officer who had made the preliminary survey reported to the Division Surgeon for duty in connection with the examination of water supplies. On this second visit it was found desirable to call upon the Division for an assistant rather than take along an enlisted man from the laboratory. Copies of the water supply reports were placed in the hands of the Division Sanitary Inspector, the Division Water Supply Officer, and the officer in charge of the Sanitary Squad. Sections of the area deserving special attention were pointed out. The criteria on which waters had been passed as good or bad were explained. Attention was also called to the placarding, the time devoted to the survey, and other features of interest. After permission to cooperate with the division Water Supply Officer in improving water supplies had been obtained and suitable transportation had been provided, conferences were held with the Medical Officers of each town in the area or unit in the division.

On these inspections or constructive survey tours the reports on the towns in question were gone over carefully with the Medical Officer in charge and the water points in actual use were surveyed for a second time, wherever possible. Water points are generally chosen because of their convenience. Unforeseen factors of pollution, such as improperly placed latrines, or special local problems, such as a scarcity of water in a particular locality, were often met on this inspection. Rearrangements in the location of kitchens or Lyster bags often solved the problem. It was sometimes necessary to condemn certain supplies for use for all purposes. Arrangements were sometimes made whereby the levying of water could be distributed over several water points. This was generally necessary where rain-water cisterns constituted the chief source of supply. The condition, number, and location of the Lyster bags was noted. Bags were often hung too low and subject to being splashed with mud or within the reach of dogs and other small animals. On the other hand, bags that were hung too high often contained unpalatable water due to incomplete filling with water or failure to empty out the stale water. Attention was called to upturned spigots denoting that water was being obtained by applying the lips directly to the spigots. Where water supplies had been passed as safe without treatment, it was explained that this did not apply if the water had to be handled in any

way; canteens were to be filled directly from the tap. Where chlorination had been recommended in the report, tests were made to determine the efficiency of the treatment with a special outfit provided for the purpose. Testing outfits and material were left with Medical Officers for distribution or for checking up the efficiency of chlorination in their towns. Instructions in the chlorination of water, in the care of Lyster bags, and in testing chlorinated water were given to water details. Typewritten copies of these instructions were left with the Medical Officer in charge; in some instances these instructions were framed and placed near Lyster bags for reference. Practical demonstrations were given on the inspection of hypochlorite tubes and the rules governing the rejection of defective tubes were stated. The importance of permanent water details was emphasized and Medical Officers were circularized to this effect from the Division Surgeon's office. With the possible exception of lack of transportation on the part of the Division Water Supply Officer, the greatest source of difficulty in the way of securing properly chlorinated water was the ever changing personnel of the water details. When a Division Water Supply Officer has suitable transportation and testing material at his disposal and permanent water details have been established, the failure to chlorinate water properly can be easily made a matter of discipline, inasmuch as responsibility can then be definitely fixed.

During these inspections particular attention was paid to the condition of the placarding. As stated above, placards indicating the location or the quality of the water points had been put up on the preliminary survey. In few cases did it appear that the signs had been taken down by the civilian population before the arrival of the troops. In rare cases the too liberal use of wire in attaching a sign may have proved a temptation, or else an easily translated sign such as "Dangerous" or "Condemned" may have been removed by the owners of the well or spring. Every effort was made to use signs of the same general appearance, and signs left by divisions that had occupied the area at an earlier date were seldom left in place. These signs were invariably removed by any incoming division, and more or less promptly replaced by signs adorned with the cherished geometrical design or forest denizen. The signs put up by the Central Medical Department Laboratory did not bear any distinctive emblem and seemingly fared better for the omission. The free use of signs is the most direct way of conveying to the enlisted men desirable information concerning their water supplies and of keeping that information fresh in their memory. The wording, general appearance, and authority for the signs are, therefore, matters of importance. For decorative purposes the medical caduceus could advantageously

replace the divisional emblems. Signs were placed on mess halls, recreation rooms, orderly rooms, infirmaries along the main streets, and, of course, on the water points themselves. The size of the signs was 10" x 20" for the larger signs and 5" x 20" for the smaller ones. Salvaged tins furnished the material for the signs. After being thoroughly cleaned the tins were cut to size and given a coating of white paint. The lettering and border could be red, blue, or black. Black on a yellow background is said to be more legible than any other combination. A list of the conventional wordings of the signs is given below. Many of these signs are too long. Impromptu signs sometimes met, such as "DON'T DRINK," represent more nearly the average enlisted man's idea of a sign. Lyster bags and water carts should also be placarded. Water carts in many instances were not chlorinated, the usual reason for not doing so being the tastes imparted to tea, coffee, soup, and rice whenever over-chlorinated water was used. Water carts were generally placarded "DO NOT DRINK THIS WATER." Lyster bags should be placarded for the half-hour period following the addition of the hypochlorite. A good way of conveying this information is by the sign "DO NOT DRINK UNTIL THIS SIGN HAS BEEN REMOVED." Signs reading "DO NOT DRINK UNTIL (Time)" are of little value. Signs warning against the use of common drinking cups are also necessary and can be combined with the important sign "DO NOT DRINK FROM SPIGOTS, USE YOUR OWN CUP."

AMERICAN EXPEDITIONARY FORCES
SAFE
DRINKING WATER
By Order of Commanding General
WATER
GOOD TO DRINK
By order of

SOURCE OF WATER SUPPLY
KEEP IT CLEAN

TO WATER POINT

—————→

FOR
Animals, carts, and men.
TAKE WATER HERE
FOR LYSTER BAGS
AND WATER CARTS

AMERICAN EXPEDITIONARY FORCES
DO NOT DRINK
THIS WATER
By Order of Commanding Officer
WARNING!
U. S. TROOPS, AMERICAN E. F.
Drinking water from all sources in this
town must be sterilized.
By order of

WATER
NOT GOOD TO DRINK WITHOUT
TREATMENT

WARNING!
Do not drink from wells or springs.
Use water from Lyster bags or water
carts.

WARNING!
THIS WATER IS CONDEMNED FOR ALL
PURPOSES
By order of

When properly instructed and permanent water details are in operation and the water points have been abundantly placarded, the use of water from unauthorized sources or the presence of unchlorinated Lyster bags may make it necessary to pass from the realm of the Medical Department and request appropriate action to remedy the indicated laxity in the matter of water discipline. In an isolated case this may mean a request for disciplinary action against the offending party or a request that a guard be placed over a particularly dangerous water supply. In one instance it was requested that guards be placed over the water supplies of an entire area, comprising some 50-odd towns and approximately 1,000 water points. The results were highly satisfactory, and it is believed advisable to reproduce the Memorandum as a model.

HEADQUARTERS—...TH DIVISION
AMERICAN EXPEDITIONARY FORCES

Memorandum No.

January 6, 1919.

Subject: Health of the Command.

1. The spread of typhoid is increasing instead of diminishing. The situation has become serious and threatens to hold this Division in its present area until conditions improve.

2. In the opinion of the Division Surgeon, this infection of typhoid is due entirely to the lack of discipline in the use of drinking water. Stringent orders have been issued from these headquarters prescribing the precautions to be taken as regards the use of drinking water by members of this command. These orders and regulations are being wilfully disregarded by members of certain organizations, due primarily to gross neglect on the part of organization commanders concerned in not enforcing standing orders.

3. (a) Regimental and separate organizations will place a guard on all points at which water may be obtained; this guard will be instructed to prevent the use of such water for drinking purposes.

(b) Company Commanders and commanders of similar units will be held personally responsible: (1) that a suitable number of serviceable Lyster bags are located convenient for the use of the men; (2) that men found drinking water from any source other than the company Lyster bag be promptly court-martialed for disobedience of orders; (3) the Company Commander, in person, will supervise the chlorinating of all drinking water for his command and will make daily report to his Battalion or next higher commander to this effect.

4. Brigade Commanders will be held strictly responsible for the enforcement of this order throughout the organization of their command. This duty will not be considered as properly discharged by the mere issuance of orders on this subject. Personal inspections must be made daily by Brigade Commanders, in addition to inspections by officers of their Staff, which they may direct.

5. The Commanding Officers of companies and similar units will read this order, in person, to their respective commands, at the first retreat formation after receipt thereof, and at each successive retreat formation to include January 21.

By command of Major General

The second survey, therefore, constituted a check upon the accuracy of the preliminary survey, and while intended to place the information

gathered directly into the hands of the divisional authorities it offered splendid opportunities for personal conferences on how the recommendations made in the report could best be put into effect. Placarding campaigns were instituted; permanent water details were established and instructed in their duties; uniform methods for the chlorination of water were inaugurated. The tests made on Lyster bags gave the Medical Officers concrete evidence as to the efficiency of their water details. The inspections, instructions, and Lyster bag tests were generally made in the presence of the Medical Officer in charge. Reports and recommendations were also made to him directly. Regimental Surgeons were kept informed as to conditions in the various towns under their supervision and daily reports on the progress of the work were made to the Division Surgeon through the Division Sanitary Inspector. In conclusion it might be added that this work is best done by an officer not permanently attached to a Division.



WATER SUPPLY FOR RAILROAD TRANSPORT SERVICE¹

BY CAPTAIN C. T. MALE
Sanitary Corps, U. S. Army

1. It is estimated that the average combat unit spent a total of about two weeks traveling on trains in France. This included the time in transit from the port to the training area, thence to the line and back to the port; many units spent considerably more time than this en route. It is further estimated that during the summer and fall of 1918, when our troop movement was at its height, there were about 50,000 troops constantly en route on trains. Casuals and men traveling on leave are not included in the estimate.

2. The ordinary facilities at the stations where troop trains regularly stopped consisted of from one to four faucets delivering water of doubtful quality under low pressure. At some of the more important stations the French had established coffee stops, and arrangements were made with the French authorities whereby our troops en route were served with coffee. In addition to this, the American Red Cross had established canteens and rest stations at several other important points. These points were for the most part very well chosen, but up to June, 1918, no systematic attempt had been made to insure an adequate supply of good water for the troops at regular intervals along the whole route.

3. Two possible methods of supplying this water for troops in transit had been suggested: (1) The installation of suitable containers in the cars; (2) the establishment of adequate facilities at certain points along the routes.

The first method was found to be impractical because various types of cars were used to transport troops. The same cars were not continuously used to transport troops, and equipping all the cars which might have been used for this purpose would have been a stupenduous task. Even so, containers so installed would necessarily have to be filled at various points along the route, necessitating the establishment of water points for this purpose.

4. In July, 1918, a Sanitary Corps officer was detailed to study troop movements and make recommendations to the Engineer Corps for the construction of adequate facilities at certain stations where troops en route might fill canteens with approved water. Our troop trains were routed by the French authorities, and although they were not always run on schedule time they ordinarily utilized the same points as regular stops. This reduced the problem to a study, first, of routes commonly used by our troop trains, and then of the quality and quantity of the water supplies and of the facilities existing at those stations where troop

¹ This paper was prepared for incorporation in the volume dealing with water supplies to constitute part of the History of the Medical Department in the World War.

trains regularly stopped for a period of ten minutes or more. Some stations were immediately eliminated because of the limited supply of water, or because the track yard was so large as to render it difficult to select a suitable point for the installation of accessible water supply facilities, or because of some other local condition which might render it inexpedient or dangerous to encourage debarking an entire trainload of troops.

5. The preliminary investigation consisted of a study of main troop routes, with an estimation of future troop movements; a study of troop train schedules as followed under ordinary conditions; a selection of important railroad stations for a more detailed survey. This detailed survey of individual stations included information concerning: (1) the frequency and size of passing troop trains, in order to estimate the facilities necessary to meet a varying demand; (2) the ordinary length of time of stop; (3) the quantity and quality—including analysis—of existing water supply; (4) the layout and size of the track yard; (5) the construction necessary to install adequate facilities; (6) information as to whether or not the requisite authorization for such construction might be readily obtained from the French authorities.

6. Then, according to the normal troop train schedule, the most feasible points along the routes were selected in order to permit troops to fill canteens at intervals of six or eight hours. If the sanitary survey showed the water to be of approved quality and of adequate quantity it was only necessary to install the requisite number of faucets to permit a whole train load of troops to fill canteens in a reasonable time. With an ordinary pressure of thirty pounds per square inch in a two-inch supply pipe, a train load of 1,200 troops should be able to fill canteens in about fifteen minutes from twenty faucets.

7. At the average station, however, the water was found to be unsafe for drinking without treatment. It was possible as an emergency measure to install a sufficient number of Lyster bags in which such water might be treated, but the use of Lyster bags for this purpose was not found to be satisfactory: first, because of the number required and the labor involved. Assuming that two troop trains followed each other closely, at least twenty-five bags with the necessary detail of men for filling and treating the water would be required; second, the difficulty of providing adequate supervision to secure uniform treatment; third, the irregular and spasmodic requirements for troops in transit over many of the routes.

8. The most satisfactory installation was an adaptation of the British method of furnishing water for such points. This consisted in treating the water in two rectangular tanks, each having a capacity

of 400 gallons and fitted with suitable faucets along the sides of the tanks or having a suitable number of faucets attached to a pipe leading from the tank. These tanks were connected, the connecting pipe fitted with a valve to permit alternate use, so that while one tank was in use the contents of the other could be undergoing treatment. Where water was piped to the tank this installation was readily taken care of with very satisfactory results by one responsible, trained enlisted man.

9. The water supplies at railroad stations which were surveyed by our water service were labeled. An attempt was made to get a standard set of water signs for posting at such stations. Several "standards" were evolved; so that it was difficult in traveling from one section to another to be sure that all signs had been posted by our service. It is difficult to post supplies at places like railroad stations which are at the same time subject to civilian consumption. The sign should clearly state that the water is approved or is not approved "for U. S. troops" (we have no authority to condemn or approve such water supplies for civilian consumption).

10. The scheme of developing enough water points at railroad stations to include the main routes followed by our troops was well under way when it was interrupted by the signing of the Armistice.

11. The next step contemplated, and which would have been carried out, was to have had available information on the quality of the water supplies and facilities existing at the stations put into the hands of the various troop movement bureaux at the base ports and forwarding camps. Then a list of stations where approved water could be supplied troops en route could have been given to the train commanders at the beginning of the trip, with instructions to prohibit troops from taking water at unauthorized places. It frequently happened that after a train had been on the road for several hours a train commander would permit troops to take water from unapproved sources, not knowing, perhaps, that facilities existed at the next station where troops could fill canteens with approved water. Getting such information into the hands of train commanders at the beginning of a trip is very important; troops must have drinking water, and it would seem that merely giving a prohibitory order in such a case would not be sufficient.

12. The relatively small number of men on the average freight train enabled the crews to carry containers filled from approved sources with sufficient water to last two or three days. Our main freight routes were somewhat different from the routes ordinarily followed by our troop train movements, and no special precautions were necessary.

13. Our hospital trains had tank capacity sufficient to carry water for about three days' supply, and they were also equipped with apparatus

to sterilize the drinking water, so that it was only necessary to survey and label such supplies as they might have occasion to use. As in other cases, water supplies not so surveyed and labeled by our water service were considered as suspicious, and consequently treated.

14. The following program to provide suitable water for troops in transit had been adopted but had not been entirely carried out when hostilities ceased:

(1) A study of troop routes and train schedules, including investigation of local conditions for detraining troops, and a sanitary survey of water supplies where troop trains regularly stopped.

(2) From such data a selection of certain stations to be considered water stops, so that troops en route might fill canteens at intervals which ordinarily would not exceed six to eight hours.

(3) The development of facilities at such stations to permit a whole train load of troops to fill canteens with approved water in a reasonable time, say ten to fifteen minutes.

(4) Posting with standard signs such water supplies as had been surveyed by the water service.

(5) Furnishing train commanders at time of entraining with information as to where troops would be expected to get water.

(6) Supervision of such supplies by water service.

It is desirable that some central head should be responsible for obtaining the information and in turn passing it on to train commanders. The construction of facilities and the supervision of water supplies at selected points might well be carried out by Base section organizations; but troop routes should be studied as a whole and not as they may be limited by Base section lines, inasmuch as the question of troop movements frequently presented problems which demanded a centralized survey for their solution. This presupposes a very close liaison between the man who has studied the problem as a whole and the men in the field representing the Base sections.

15. From our observations, the British method of furnishing facilities at railroad stations for troops en route was very satisfactory. Their study of troop movements resulted in a selection of certain stations where facilities were installed which ordinarily included the following features: tanks for treating drinking water with hypo-chlorite; a sufficient number of faucets for filling canteens; facilities for making and serving coffee; latrines which were practically non-soilable and easily cleaned, with separate urinals, and with an incinerator for burning the faeces; and ablution facilities for officers and men. It was not possible to develop all water stops to this extent, but it is believed that such facilities should be installed whenever possible and expedient.

CHLORINATION OF WATER SUPPLIES¹

BY CAPTAIN WALTER C. RUSSELL

Sanitary Corps, U. S. Army

IT WAS the policy of the Water Supply Service to require all water used for drinking purposes by the members of the American Expeditionary Forces to be sterilized, which was not found to be potable by a series of bacteriological examinations. This policy was put into official form in General Orders No. 131, 1, 2, c, G. H. Q., A. E. F., August 7, 1918, which read in part as follows: "All water to be used by American troops shall be considered of doubtful quality, and, when required for human consumption, shall be treated unless proven good by a succession of satisfactory examinations and laboratory tests."

About 85 per cent of the supplies examined were found to be unsafe according to the standards of the Treasury Department for Interstate Carriers, hence sterilization was necessary and the method universally employed was that of the use of liquid chlorine or the compounds of chlorine.

Liquid Chlorine.—In the Advance, Intermediate, and Base Sections of the Services of Supply and in the Paris District machines for treatment with liquid chlorine were installed in a number of cities and towns, permanent camps, and at base hospitals where the number of troops on duty warranted an installation. As a general rule, an installation was not made for less than 1,000 troops. In some cases it was possible to treat the supply which was provided by the French authorities, but in many cases it was necessary for the Engineering Department to install pumping stations.

The machines used in these permanent installations were of the Wallace & Tiernan type, both direct and solution-feed treatment being used. From May 1, 1918, until May 1, 1919, eighty chlorinating machines were installed at points in the sections of the Services of Supply.

The following data show the amount of liquid chlorine used and the effectiveness of the treatment of the water of the Cher River at Tours (Indre and Loire), France. The water was pumped by the French city plant. This set of data covers a period of 129 days, from October 1, 1918, to February 28, 1919.

¹ Section of a report on water supply activities in the American Expeditionary Forces prepared for the Division of Sanitation and Inspection, Office of the Chief Surgeon, A. E. F., for incorporation in the Medical and Surgical History of the World War.

Average number of gallons pumped in 24 hours: 3,500,000.

Amount of liquid chlorine added in parts per million: Maximum, 3.12; average, 1.87; minimum, 0.98.

	<i>Days safe</i>	<i>Days unsafe</i>	<i>Total Count at 37° C (median value)</i>
Untreated water.....	0	129	146
Treated water.....	116	13	33

(NOTE.—The word “unsafe” in this case means the presence of *B. coli* in 30 c.c. portions.)

At Dijon (Cote d’Or), France, the city water supply was treated with an average of 0.1 of a part per million of liquid chlorine. The treated supply was consistently safe, conforming with the Treasury Department Standards for Interstate Carriers.

At the Hospital Center, Langres (Haute Marne), France, filtered water from the Marne River was treated with liquid chlorine at the average rate of 0.5 parts per million. The treated effluent was uniformly safe, according to the standards of the Treasury Department for Interstate Carriers.

With proper control, the plants using liquid chlorine produced a treated water without a disagreeable taste or odor when taken at the delivery taps.

In the Zone of the Armies, in addition to permanent installations of chlorinating machines, mobile purification units, chloro-pumps, and “steri-labs” were used for the application of liquid chlorine. “Steri-labs” were equipped to filter, chlorinate with liquid chlorine, and dechlorinate with sodium thiosulfate, while chloro-pumps were designed for treatment with liquid chlorine only. Both of these types of mobile units were equipped with gasoline motor pumps for obtaining the water supply for treatment.

During advances, such as the St. Mihiel and Meuse-Argonne operations, these mobile purification units were used to supply sterilized water for the advancing troops. As the troops advanced the mobile units were moved forward to water points in the newly occupied territory. Eleven of these units were used by the First and Second Armies in the St. Mihiel and Meuse-Argonne offensives. As the mobile units advanced, permanent installations of chlorinating machines were made at the more important points along the line of advance. The First and Second Armies up to November 11, 1918, had been provided with fifty-four chlorinating machines for permanent installation. On May 1, 1919, the Third Army (Army of Occupation) had been furnished with about thirty machines for use in towns in the occupied territory.

Chlorinated Lime in Small Containers.—Lyster bags and water carts or tanks were used in all places where water was not treated in a central chlorinating plant, such as in the case of troops located in French villages in billeting areas and small organizations or detachments at a permanent station. Chlorination in these containers was accomplished by the use of chlorinated lime put up in one gram portions in glass ampules. The supply for treatment was obtained in general from springs and wells belonging to the French population.

Section (a) of par. 9, Memoranda 5 and 7 (Revised), Office of Chief Surgeon, A. E. F., Division of Laboratories and Infectious Diseases, dated August 14, 1918, describes the official method for treatment with chlorinated lime in one gram tubes:

“(a) The official method of sterilizing water is by means of calcium hypochlorite. The powder is issued in one gram tubes. One tube is usually sufficient to sterilize one Lyster bag full of water. Break a tube of calcium hypochlorite into a clean ordnance cup, moisten the powder with a few drops of water and mix into a smooth paste. Now fill the cup with water to within one inch of the top and mix thoroughly by stirring with a clean spoon. Add this solution to a Lyster bag filled with clear water, stir thoroughly *and allow to stand 30 minutes before using*. After 30 minutes test a cupful by adding ten drops of a solution containing 10 per cent potassium iodide and 1 per cent soluble starch (supplied in laboratory equipment). The appearance of a blue color is indication that sufficient chlorine has been added to the water. If no color appears the water is highly polluted and should be reported immediately to the Medical Officer having water supplies under his supervision.”

Difficulty was experienced in obtaining a supply of tubes of a uniform character. The chief defects were the imperfect sealing of tubes, cracking and breakage in transit, use of chlorinated lime of an inferior quality, and that some tubes contained less than one gram of the powder. These defective tubes were eliminated to a large extent; in the case of tubes already in warehouses, by inspections. Defective tubes were classified as follows: (a) those with one or both ends broken; (b) those with cracks of any size; (c) those in which the powder is moist; (d) those with pin holes in the end, being a sign of improper sealing, and (e) those which are only one-half the size of the average tubes.

Some inspections were made in warehouses at the base ports, but in order to avoid issuing tubes which had been broken in transit or whose contents had deteriorated from long standing in a warehouse, after the first inspection, it was found advisable to inspect the supplies as near the time of issue to organizations as possible. In the case of divisional

supplies, for example, inspections were made under the direction of the divisional water supply officer.

Since many tubes were improperly sealed, or contained a chlorinated lime inferior in quality and in weight per tube, recommendations were made asking that Government inspectors be placed in factories where tubes were prepared; to see that specifications were complied with.

Javelle Water.—Although Javelle water was not in as general use as liquid chlorine and chlorinated lime, yet it was employed in some instances. Since javellization was the method employed in the French Army and by the French civilian authorities for the sterilization of water, supplies of Javelle water were easily obtainable in almost all parts of France. In nearly all instances of its use it was employed in central chlorinating plants rather than in hand sterilization of water in containers such as Lyster bags and water carts. In Base Section No. 7, for example, Javelle water was easily obtainable from a manufacturing plant in that vicinity, and was used with success in a number of small plants whose capacity was not large enough to warrant the installation of liquid chlorine machines.

In the Zone of the Armies, Javelle water was used by some organizations of the Water Supply Service for hand sterilization of water in tanks, tank cars, and water carts. The solution was obtained from the French Army supplies, and the available chlorine determined by the mobile laboratories before using.

Avoidance of Strong Taste from the Use of Liquid Chlorine or Compounds of Chlorine.—To most individuals the presence of 0.6 parts per million of excess chlorine in a water gives a slight but not disagreeable taste. Above this limit the taste becomes disagreeable, but with smaller amounts, 0.2 to 0.4 parts per million, the taste is rarely noticeable. The avoidance of this taste is a matter of the adjustment of the dosage, dechlorination such as may be accomplished by the use of sodium thiosulfate or of allowing the water to stand until most of the chlorine has been used in the oxidation of organic matter.

In a central chlorinating plant or in the use of a mobile purification unit, the operator could adjust the dosage to the rate of flow and thus not overdose a water, but the adjustment of dosage in the use of Lyster bags or water carts was not as simple a matter.

A one gram tube of powder of good quality, containing 28 to 33 per cent of available chlorine, will give 2.0 parts per million or more of free chlorine to a 36-gallon Lyster bag of water. With most waters a one-gram tube of powder of this quality gave too large an excess of free chlorine.

By using the "cup titration" method for one gram portions of

chlorinated lime, as given in section (c) of par. 9, Memoranda 5 & 7 (Revised), Office of Chief Surgeon, A. E. F., Division of Laboratories & Infectious Diseases, dated August 14, 1918, and in the Appendix of Memorandum No. 25 from the same office, the fraction of the contents of a tube necessary for the sterilization of a given water could be determined. The use of the fraction of a tube, determined by this method, reduced the dosage sufficiently to prevent a disagreeable taste being imparted to the water and at the same time allowed a margin of safety for any variation in the quality of the chlorinated lime used.

The following data from experiments carried out at the Central Medical Department Laboratory at Dijon (Cote d'Or), France, show the efficiency of chlorination in a Lyster bag and at the same time the results of treatment with a fraction of a tube. Titration of water from the Ouche River, by the cup titration method, showed that one-half of a tube of chlorinated lime which contained 1.035 g. of powder, containing 22.9 per cent available chlorine, was sufficient to sterilize this water. This amount did not give a disagreeable taste to the water. The bags were hung in the laboratory building at a temperature of 18° to 20° C. The table on the following page gives the results of the treatment.

A number of Lyster bags in use where troops were billeted in French villages, under field conditions and using different sources of water supply, were treated with one-half tube (0.5 gram) amounts of chlorinated lime. Of samples taken from fifty-six of these bags, all showing positive tests for free chlorine, only two were classified as non-potable by a bacteriological examination (Treasury Department Standards). Both of these samples were taken 24 hours after treatment. One was reported non-potable on account of a high total count, but no *B. coli* were present in a 50 cc. portion, while the other showed a high count and 80 *B. coli* per liter. Water treated with this reduced dosage did not have a disagreeable taste and a sterile supply was obtained.

Control of Chlorination.—In the case of central chlorinating plants, control of treatment was maintained by bacteriological examination and by the use of indicators such as starch-potassium iodide or orthotolilin in testing for the presence of free chlorine. Control of treatment in Lyster bags and water carts and of the effluent from steri-labs and chloro-pumps was usually maintained by the use of the indicators just mentioned. Bacteriological analyses were made from time to time to check the efficiency of the control with indicators, but only in very rare cases were samples of water, which gave a positive test for free chlorine, found to be non-potable.

Table Showing the Results of Treating Water in Lyster Bags with Calcium Hypochlorite.

(Period of time: February 3, 1919, to February 8, 1919.)

Source, water from river Ouche at Dijon	Time elapsed since treated, hours	Bacteria				Chlorine P. P. M. added	Chlorine P. P. M. found (excess)
		Total count on Agar	B. Coli.				
			No. 10 c.c. tubes posi- tive out of 5	In			
				1.0	0.1		
2.3.19 untreated		660	5				
2.4.19 Lyster bag untreated		700	5				
Lyster bag treated . .	1 12	110	0			1.30	
Lyster bag treated . .	1 6	80	0				
Lyster bag treated . .	1 3	54	0				
Lyster bag treated . .	½	20	0				0.60
Lyster bag treated . .	1	18	0				
Lyster bag treated . .	2	23	0				
Lyster bag treated . .	3	22	0				
Lyster bag treated . .	4	11	0				0.60
Lyster bag treated . .	6	12	0				0.60
Lyster bag treated . .	7	6	0				
Lyster bag treated . .	23	12	0				0.60
Lyster bag treated . .	25	14	0				
Lyster bag treated . .	28	6	0				0.25
Lyster bag treated . .	31	9	0				0.17
Lyster bag treated . .	36	100	0				
Lyster bag treated . .	47	260	0				0.10
Lyster bag treated . .	50	100	0				trace
Lyster bag treated . .	52	350	0				
Lyster bag treated . .	56	81	0				
Lyster bag treated . .	71	500	0				
Lyster bag treated . .	75	200	0				
Lyster bag treated . .	77	3,000	0				
Lyster bag treated . .	96	5,000	0				

WATER SUPPLY SURVEYS¹

BY MAJOR H. B. HOMMON
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WHEREVER possible, the water supplies of any territory to be occupied by troops should be examined and reports prepared in advance of the arrival of the troops. The survey should be made by an officer experienced in water supply work, and the data prepared so as to be readily available for the Water Supply Officer attached to the troops moving into the area.

In the sanitary water surveys that were made in the 17th Training Area of the Advance Section, S. O. S., the information desired was printed on forms that were filled out in the field. A copy of one of these forms filled out is given below to show the extent of the information obtained:

Training area: 17. Town: Laferte-sur-Amance, Haute Marne.
Date of survey: 11-14-18. Survey by: W. C. Russell, 1st Lieut., San. Corps.
Billeting capacity: 740 troops—122 horses.
Civilian population: 370.
Sickness traceable to water supply during the past year reported by: (a) French authorities—no report. (b) U. S. Army—none.
Topography: Main part of village on hill top. Another section at station in valley.

WATER SUPPLY

Type: Spring feeding hydrants. Dug wells.
Location of Hydrants: 1 opposite Billet 18, Rue St. Bernard. 2 at Billet 16, Grande Rue. 3 opposite Billet 43, Grande Rue. 4 at Billet 2, Rue de Prieur. Fountain at center of town.
Location of Principal Supplies: Spring 1, 4 kilometers north of village. Well 6 at Billet 21, Grande Rue. Well 7 at fountain at center of village. A number of large wells are located at sides of streets in different parts of village.
General Surroundings: Spring 1 is located in a woods. No houses or barns in vicinity. The reservoir is located at side of road entering village from Bourbonne-les-Bains. A few houses are near the reservoir. Wells are located at sides of roads, and in yards, close to houses and barns.
Ground Formation:
Dimensions: Capacity of reservoir, 300 cu.m. (81,000 U.S. gals.). Average depth of wells, 30 ft.
Construction: Spring 1 and reservoir are lined with mortared stone and covered. Water passes from spring to reservoir through concrete mains, from reservoir to four hydrants and one fountain through iron mains. Wells have loose stones linings. A few curbing are satisfactory. Very few covers provided.
Quality: (a) Sanitary survey—Spring 1, very good. Wells bad.
Laboratory: (b) Examination—Bacteriological examination at Central Medical Department Laboratory 11-18-18, Potable—11-29-18, non-potable.

¹ Section of a report on water supply activities in the American Expeditionary Forces prepared for the Division of Sanitation and Inspection, Office of the Chief Surgeon, A. E. F., for incorporation in the Medical and Surgical History of the World War.

Sample of 11-29-18 was taken after rains. All water used for drinking purposes must be boiled or chlorinated.

Quantity: (a) Requirements—Troops at 5 gals. per head per day—3700 gals.

Horses at 8 gals. per head per day—960 gals.

Supply: (b) Sufficient. Does not fail in summer.

Placarding: Principal supplies and towns to be placarded with warning signs
Supplies in vicinity of mess barracks to be placarded "Take Water Here for
Lyster bags or Water Carts."

Remarks: Supply for small section of village at station is obtained from a few.
private wells of very poor quality. All water taken from these wells must
be treated.

Reports similar to the one given above were prepared for each billeting town in Training Area No. 17 as well as all the others, and three copies of the combined report were given to the Zone Major in the Area. The Division Surgeon and the Divisional Water Inspector were each given a copy upon their arrival in the area, and with the aid of the data contained in it the Division Water Inspector was able to concentrate his attention at once on those water supplies which had shown the greatest contamination. If the Division Surgeon and Water Inspector left an area with troops they were requested to return their reports to the Zone Major of the area for file until new troops arrived. In addition to the individual reports for each town in an area there was prepared a summary of all the towns. The summary for Training Area No. 10 is given below, to indicate what seemed most important as a general résumé of the water supply situation for that area:

SUMMARY REPORT OF THE WATER SUPPLY SURVEY IN THE 10TH TRAINING AREA

ADVANCE SECTION, SERVICES OF SUPPLY

Training Area.—The area comprises approximately 400 square miles, and contains some 78 villages. The area is about 25 miles across at its greatest length, and 16 miles wide at its greatest width. The Zone Major's office is at Prauthoy, which is about 65-70 kilometers from Dijon on the route from Dijon to Langres. An Assistant Zone Major is located at Champlitte.

Date of Survey.—The survey was made during the period from November 25 to December 19, 1918. The period between December 19 and December 27 was devoted to the collection of samples and completion of reports. During the entire time from November 25 to December 27, 1918, 9 days were lost because of lack of transportation.

Billeting Capacity.—35,000 troops; 6,500-7,000 animals.

Civilian Population.—There are some 78 billeting towns in the area, with a total population of approximately 25,000 people. The population is distributed as follows:

100 and under.....	15 villages, or 19 per cent
100 to 200.....	29 " or 37 per cent
200 to 300.....	18 " or 23 per cent
300 to 400.....	9 " or 12 per cent
400 to 500.....	3 " or 4 per cent
500 to 1,000.....	2 " or 3 per cent
1,000 to 2,250.....	2 " or 3 per cent

Thus practically 80 per cent of the villages in the area are under 300 population, while 15 per cent of the entire population of the area live in the two largest villages. Outside of a few minor, unimportant industries at Champlitte, the only industry of note is located at Farincourt. Here there is a fair-sized foundry. The basket makers at Bussieres and surrounding villages may be classed with the agricultural workers. Thus practically the whole area is devoted to agriculture and the production of wine.

Sickness Reported During the Past Year which Might be Due to Water Supply.—French authorities: No sickness which might be traced to water supply reported by any of the French authorities in any case. American reports: Reports are rather difficult to procure from the troops formerly in the field. The C. O. Sanitary Squad reports dysentery among the 304th Engineers at Maatz during September, 1918. Dysentery also occurred among the French civilian population at Occey during the period elapsing between the departure of the 79th Division and the arrival of the 82d. The supply at Coublanc seems to be in rather ill repute also. None of these cases have been proven against the water supply, but great care should be exercised in handling these supplies, and they should be checked up carefully and frequently.

Topography.—The whole area is situated in the Plateau D'Langres. The altitude is from 1,100 to 1,500 feet. The area is very hilly for the most part. The eastern and southeastern portions in particular are very hilly. The eastern parts are also hilly. Along the Marne-Saone Canal the land is more level. A few of the villages are located in the valley bottoms, but most of them are snuggled up close to the hillsides.

WATER SUPPLY

Type.—The supplies may be listed under the following heads:

Cisterns and springs.....	3 villages
Wells only.....	7 "
Springs only (these are usually springs in place).....	11 "
Cisterns only.....	1 "
Wells and cisterns.....	1 "
Cisterns and river water.....	2 "
Wells, cisterns, and springs.....	52 "
Total.....	77

NOTE.—The greater part of the springs listed under "springs and wells" are central supplies, piped in from the hills near the village.

General Surroundings.—The smaller villages are in the poorer condition as regards manure piles in the courtyards, muddy streets, and illy kept houses. The villages with a water supply from wells only are for the most part invariably illy kept, and the wells are invariably located near a manure pile. In villages where the natives have endeavoured to construct a water system during the past 20 years, the surroundings are usually much better. In villages where American troops have been billeted several months ago, the results of the American occupation of the villages are still in evidence.

Ground Formation.—Apparently two strata of limestone and sandstone meet in the area. In the northern and northwestern part one finds considerable sandstone. The strata is very uneven and crops out here and there. The formation in the southern and western parts is mostly limestone. There is considerable clay in the area.

Dimensions.—The wells vary from 20 to 50 feet in depth, and from 3 to 6 feet in diameter. The volume of water varies with the location of the well, the surface of the water being all the way from 4 to 30 feet from the surface of the ground. The cisterns are usually the same size as the room above. Most of them are located under the houses.

Construction.—The wells are for the most part loosely walled, uncemented, and uncovered dip-wells. A very few of them are equipped with pumps. Most of them are provided with chain and windlass. Very few of them are covered. The cisterns are said to be cemented. They are fed by water from the roofs, which are almost invariably of tile. They are supplied with chain and windlass. Many villages are supplied by springs in place. In such cases the water is generally conducted through iron or stone pipes into reservoir, which is usually covered at the top and on three sides with one side open. Most of the central supplies are fed by springs, which are caught in reservoirs. These reservoirs are for the most part walled with stone and cement masonry. They are covered and either locked or sealed. Iron pipes are used almost entirely to carry the supply to the fountains and hydrants. In a few cases tile or stone conduits are used. The village of Heuilley le Grand has perhaps the best construction of any of the small villages. In only a few cases is a pump used to force the supply to the fountains. In most cases, the waste from the fountains supplies the lavoir and abrevoir. In several cases the waste from the fountains supplies the abrevoir, and the waste from the abrevoir supplies the lavoir. The waste from the lavoir then takes off down the street.

Quality.—Sanitary Survey:

Villages classified as having a good supply.....	31
Villages classified as having a fair supply.....	12
Villages classified as having a doubtful supply.....	12
Villages classified as having a bad supply.....	23
Total.....	78

Laboratory Examination.—The laboratory examination has shown many supplies to be nonpotable which passed a good sanitary examination. Others which failed to pass the sanitary inspection have shown up pretty good in the laboratory. In no case was the water from the wells examined. Additional work upon some of the better wells might prove of value. The results of the laboratory investigations will be tabulated and attached to this report at a later date. It is further believed that the water carts are in some cases polluted by insufficient cleansing. These will be checked up and the results attached to this report at a later date.

Quantity.—Requirements:

35,000 troops at 5 gals. per man per day.....	175,000 gals.
6,500-7,000 animals at 8 gals. per head per day.....	58,000 gals.

Total daily requirements.....	231,000 gals.
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Supply.—

Sufficient for all purposes.....	62 villages
Possibly insufficient in summer months.....	14 villages
Insufficient in summer months.....	2 villages

Total.....	78
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Bathing Facilities.—

A. E. F. bath houses in.....	35 villages
No facilities in.....	34 villages
Unlisted.....	9 villages

NOTE.—The Engineers are at present installing additional showers in various places. This list was obtained from the Zone Major's Office at Prauthoy.

Placarding.—In these reports the following system was used to designate the type of placard to be used in the village:

Type I.—“Take Water Here for Lyster Bags and Water Carts.”

Type II.—“Do Not Drink From Wells Or Springs. Use Water From Lyster Bags and Water Carts.”

Type III.—“Water Good To Drink.”

Type IV.—“Do Not Drink From This Source.”

Remarks.—The area has been well placarded by former troops. For the most part the water is being treated.

Recommendation.—The supplies that have shown up to be potable

without chlorination should be reexamined repeatedly. The villages of Occey, Maatz, and Coublanc should be watched very carefully. With the outbreak of a water-borne disease these villages may cause trouble. The Lyster bags and water carts should be checked up to insure proper chlorination. In cases where the sanitary survey showed up well and the laboratory investigation showed the supply to be non-potable without chlorination, it would be well to make a second and more thorough examination to discover if possible the source and nature of pollution.

MICHAEL J. BLEW,
First Lieutenant, Sanitary Corps.

The information given in the summary report enabled the Zone Major to know at a glance what the general situation in the Area was as regards the volume of water available, and it gave to the Division Surgeon and Water Inspector an idea of the types of water supplies from which water had to be obtained for the troops to drink.

Reports similar to the one mentioned above were prepared for ten of the Training Areas in the Advance Section, S. O. S., between October 1, 1918, and the date on which the Armistice was signed, and there were approximately 300,000 men within these areas.

Where it is impossible to make a complete water survey of any given area in advance of the arrival of the troops all water should be considered contaminated and unfit for drinking or cooking purposes without first boiling, or sterilizing with bleaching powder or some other equally effective agent. If reports cannot be prepared in advance of the arrival of troops they should however be prepared later and left on file for the troops that may come into the area in the future. When a source of water is found that shows a good sanitary survey and a satisfactory bacteriological analysis on first test the water should be used without treatment only after repeated examinations show no contamination. After a source of supply has been pronounced safe to drink without treatment it is believed that samples should be taken, at least every other day, and bacteriological analyses made to maintain proper control over it. In most instances weekly samples would probably be sufficient, and experience in the training areas has proved this to be true except in the 17th area where there was a notable exception. Here springs that gave a potable water in the dry season produced a cloudy and non-potable water during wet weather. The contamination was no doubt caused by surface water entering the spring at the outlet, and it could have been prevented by proper drainage around the spring.

The officer making the survey should be familiar with the ground formation in the neighborhood of the water supplies, the type of wells

or springs and other sources of supply, and his recommendation should be based on a complete understanding of these factors as affecting the quality of water that will be produced. The general rule that was followed in making the surveys of the training areas was to require all water to be treated unless the sanitary survey was excellent and the bacterial analyses favorable. For example, if the source of a supply was a spring located in a wooded hillside several kilometers from the town, and there were no residents near the source, the water was recommended for use without treatment, providing, however, that the bacterial results were within the standard used for interpreting the analysis. A complete description of the standard used is given in the chapter on "Clinical and Bacteriological Examinations."

As a general rule all wells examined were found to be contaminated or else subject to such great chances of contamination that they had to be condemned. Some few artesian wells or driven wells of 100 feet or more in depth were found to be safe to drink without treatment, but the number of these cases was very small compared to the total number of wells examined. This type of supply in France has not differed in any sense from similar types in the States. The wells in the rural districts and small towns of the States have never yielded a water that would pass our standard of today, and it is doubtful if any water taken from shallow depths in the neighborhood of human habitations will ever be satisfactory. It is very important that the sanitary reports indicate the towns in any given territory occupied by troops that have only wells as a source of supply, in order that the Division Water Inspector may give this type of supply the attention it requires. If a specified area is to be occupied by troops, and within it there are divisions having wells and others having springs, it is important that the water survey report contain this information, in order that the wells may be properly placarded and guarded from the beginning of an occupation of the area by troops. It is likewise important that the springs found to be badly contaminated or subject to contamination be placarded and guarded against use without treatment. Even if all water supplies in an occupied area require treatment the survey report should indicate those supplies which are least contaminated.

Maps were prepared during the first surveys that were made, and on them the different types of water supplies were indicated by special marks, and the kind of signs that were to be posted on the supply was indicated. On account of the amount of work required to prepare the maps and the limited personnel, available maps were not prepared for the later reports, but especial attention was given to exact locations and the descriptions of the supplies for each billeting town. Where time

and personnel are available, maps should be prepared and filed with each copy of the report, as they give all the information in a form that is readily available. Maps are especially valuable for the Division Water Inspector coming to an area for the first time. They are also of great assistance to the Zone Major's Office where the official records of the different areas are kept on file. When troops move into an area the Commanding Officer of Troops looks to the Zone Major's Office for data relating to the amount of water available, and the information given should indicate those supplies that are to be used for the troops, and those for the animals. Obviously if there is only a limited supply of potable water, or if some supplies are better than others, it is very necessary that the animals should be supplied from those sources least desirable for drinking purposes. It has often been the case that only cisterns were available as water supplies in the billeting towns, and in such places water had to be conserved very carefully. Knowing this in advance, watering stations for animals were established previous to arrival of troops, and even the temporary use of the cistern supplies was prevented.

Practically the only sources of information regarding the existence of water-borne diseases in towns occupied by troops of the A. E. F. were the officials of the civil government, the priests, and the civil population of the towns. This information should be obtained if possible from doctors and official records, but where it is not available from these sources reliance must be placed on those noted above. In practically all of the towns where surveys were made the information obtained showed that typhoid fever and dysentery did not exist at the time, and it was uncommon to get reports of the previous existence of these diseases in the towns. The fact, however, that all the information available indicated there were no water-borne diseases in the towns had no bearing on the recommendations regarding the quality of the water. If the supplies were from wells located within the corporate limits, which was usually the case, and the sewage from the troops would naturally drain into the ground water underlying the town, then the wells were posted as unsafe to use without treatment, and especial attention was directed towards securing strict water discipline. It is no doubt true that the absence of water-borne diseases in many of the small towns with well water supplies was due to the fact that a large part of the surface drainage including the sewage drained away from the town before entering the subsurface water, and the pathogenic bacteria in the water that did enter the ground water died before reaching the water-bearing strata supplying the wells or springs. If this were not true there certainly would have been more water-borne diseases, as all the supplies of water from wells in the

towns showed the presence of intestinal forms of bacteria. The addition of the sewage from the troops, which was often several times that of the local population, to the surface of the ground no doubt would have affected the quality of the water in the wells, and the time when this would occur would depend upon the nature of the soil and the depth of the well. Any water supply survey covering the area where troops are billeted or in camp, immediately over a subsoil furnishing the water supply, must emphasize the dangers from the sewage getting in the water and make strong recommendations for securing proper sterilization.

The sewage from troops billeted in a town or in a camp supplied by springs with sources located on a hillside at a distance from the town is not likely to affect the water from the springs, as the original source of the spring must be at a higher level than the outcropping of the springs. Water supplies of this type do not require as constant supervision as the well supplies, and the survey report should note this fact. This applies, however, only to springs located away from the towns or camps and where the water is piped through water-tight pipe to central points. The same interpretation applies to springs situated in the towns as given for wells similarly located. While the main source of the spring located in a town may be at a higher level than the town or camp, still there is a chance of the surface water entering the spring near the outlet, and these sources should be posted and carefully watched to be sure that sterilization is carried out at all times.

In many of the towns where troops were billeted the only available water supply was from cisterns. Samples collected from these sources invariably showed contamination, and the volume was never sufficient for the normal population and troops except during the rainy season. As a rule the walls were well constructed but the covering was generally defective. Most of the cisterns had not been cleaned for a year or more and as a result there was a large accumulation of organic matter on the bottom. Most of this material consisted of dead leaves, dust, and other organic matter, including bird manure, that had been washed from the roofs of the houses. There was also some material that had been washed in from the ground surface through the covering of the cistern. Privy vaults were also found adjacent to the cisterns and in some instances at a higher elevation than the top. These facts should all be noted in a sanitary survey of the water supply, and especial attention called to the fact that water containing so much organic matter requires more sterilizing chemicals than well water or water from practically every other source. The contents of one tube of calcium hypochlorite was sufficient to sterilize 36 gallons of water (capacity of a Lyster bag) taken from wells or springs or even clear river water, but cistern water

invariably required two tubes, and in one instance three tubes were necessary. Careful search should be made to secure water from wells or springs outside the towns where only cisterns are found, and their location should be carefully noted in the report. Watering places for horses should also be selected and posted if the survey is made previous to the arrival of troops; and if the troops are already located before the survey is made watering points should be selected and the cistern water conserved, even if it is necessary to take the horses or mules a considerable distance for water.

Where troops are billeted in towns with a central supply from one or more sources the survey should include a report on each supply and recommendation as to the quality of water from each. It has frequently been found that towns with more than one source of supply have one at least that is better than all the others and this one should be posted for use and the others condemned. Even if the one found best to use requires treatment it should be labeled as such and the other supplies marked non-potable and not to be used. This applies, however, only where the different sources of supply are piped to the towns in separate systems. The report on the water supplied towns or cities should contain information regarding the condition of the force mains as well as the surroundings at the source. Often the pipe lines have been in the ground for a long time and are no longer water-tight, and when the pressure becomes low ground water may enter the mains. This was undoubtedly the cause for many contaminated supplies where the surroundings at the source were the very best. Information of this character can only be obtained by personal inspection. The authorities of the towns as a rule have but meager knowledge of their water supply systems, and the only way an exact report can be made is to trace out the pipe lines in the same manner as the sources are examined. If leaks in the pipe lines are found they should be noted in the report, and an opinion given as to the probable contamination that would result should infiltration occur.

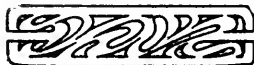
Every attention should be given to secure the best water available, even though the water is to be sterilized. Except where the water is treated at the source, it will be impossible to force all men to drink the treated water in Lyster bags, and it would therefore seem advisable to improve the general supply as much as possible. This applies only to central supplies and wells at prominent points. Wells scattered over the towns must be condemned and placarded, and the report should state the nature of the signs that have been posted on the wells or that should be posted.

A water survey report to be of the greatest value must contain all the

information necessary for the Water Inspector to form a true conception of the quality of water in his district. It should also contain data on the approximate volume of water available for troops and for animals. Where only a limited amount of potable water is to be found it should be conserved for the troops, and the animals watered at other supplies. It is also important that the supply for the town occupied be protected so as not to cause a shortage of water for the inhabitants.

If maps are not prepared, about 14 days are required to make a survey of an area containing 25,000 to 35,000 troops billeted in about 50 towns with a population of 100 to 400 each. When rough maps are made, about 21 days are required to cover an area. The time will vary depending on the topography of the country and the distance between towns. The party making the survey should consist of one officer and one noncommissioned officer; and a Ford touring car was the most suitable transportation for all kinds of roads and weather conditions. The maps were made from blue prints kept on file at the Zone Major's Office, and the water supplies were indicated on them at the time the survey was being made.

The water supply surveys should be made under the general supervision of an experienced Water Supply Officer attached to the Chief Surgeon's Office of the sections, such as the Base, Intermediate, and Advance, or to the Chief Surgeons of the Armies. The reports for all the areas or sections should be kept on file and extra copies prepared for distribution upon request. The officer in charge of all the water supply work should maintain liaison at all times with the Water Supply Officer attached to the troops or other units, in order to insure that the recommendations given are thoroughly understood and carried out intelligently.



HEMOLYTIC STREPTOCOCCUS THROAT SURVEYS AT ARMY RECRUIT DEPOTS¹

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AS a result of the numerous fatal hemolytic streptococcus infections that followed measles and influenza during the War, the possible importance of healthy carriers of these organisms was recognized very early. Numerous reports have been published of cultures made in order to ascertain the proportion of apparently healthy individuals that harbored the organism in their throats and to determine their rôle in the spread of infections. Incidence rates for carriers in these reports have in many cases been higher than fifty per cent.

There is no doubt that a considerable percentage of any group of individuals will be found positive on throat culture for hemolytic streptococci, and the percentage will always be so high as to render unfeasible any attempt to isolate carriers as is done in diphtheria and typhoid.

Several of the reports, however, indicated that during the years 1917 and 1918 the carrier rate was considerably higher among soldiers than civilians. If true, this would seem to throw light upon the greater incidence of respiratory infections in the Army than in civil life, besides possibly suggesting means for their more complete control. A comparison of army rates for these diseases with civil rates was made in a report by Vaughan and Palmer (1), who state that practically all acute diseases of the respiratory tract are considerably more frequent in the army. Levy and Alexander (2) found at Camp Taylor, near Louisville, Kentucky, that drafted men cultured as they arrived on the train showed a streptococcus carrier incidence of fourteen per cent as compared with an incidence of eighty-three per cent for men who had been on duty at the camp for a period of six months or more. Cummings and Spruitt (3) have also emphasized the existence of a much higher carrier rate in soldiers than in civilians. The inference from these observations was that the mode of life of soldiers caused a large number of newcomers enlisting in the Army to become immediately carriers of hemolytic streptococci, and this increased number of carriers in turn was at least partly responsible for the increased prevalence of disease. It also suggested the use of the incidence of carriers of hemolytic streptococci as an index of the sanitary condition under which the troops were living as affecting the spread of respiratory infections.

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The work reported in this paper was undertaken with the purpose of extending the investigations mentioned above and to ascertain more precisely whether the different modes of life of soldiers and of civilians influenced in any way the incidence of carriers of hemolytic streptococci occurring among them. It was of course impossible to duplicate the crowded conditions that prevailed during the period of mobilization, but it was felt that figures obtained even in time of peace would be valuable in themselves, and afford important information as to the relative incidence of carriers in the Army and in the population at large. It was also desirable to determine whether any increase in the number of carriers occurred among soldiers immediately after the change from civil to military life.

Recruit depots seemed especially suitable for such a survey. They have almost constantly shown a high rate of infectious diseases, and at times extensive epidemics of measles with a high rate of mortality from broncho-pneumonia. These epidemics are mentioned in the Reports of the Surgeon General, U. S. Army, besides being described in more detail by Christie (4) and Kilbourne (5). Furthermore, recruit depots offered the opportunity for culturing civilians as they arrived preparatory to enlistment, and for comparing the incidence of carriers among them with that prevailing among soldiers permanently on duty at the post. This would eliminate any error due to culturing soldiers at one place and civilians at another. The individuals cultured would belong to the same age group and the same social class. The figures so obtained should be strictly comparable with each other. Such a plan had also the great advantage that all the work would be done by the same observer with uniform technique. The recruit depots at Columbus Barracks, Ohio, and Fort Slocum, New York, were selected as being representative. The results obtained at Columbus have been previously reported (6), but are repeated in part here since the work done at both places was part of the same plan.

TECHNIC

The statistics of various authors relating to streptococcus throat surveys may be discordant on account of variations in technique and hence not comparable. The dividing line between hemolytic streptococci and non-hemolytic streptococci is not always sharp, and variations in the kind of blood used and in the criteria of hemolysis may give rise to different results. It is essential that a standard method be used. Streak cultures on blood agar plates can not be relied upon for the final differentiation, since many strains grow on it with weak or indistinct hemolysis, and cannot be clearly classified. This is especially true when

human blood is used. The most satisfactory standard of hemolysis seems to be the use of washed red blood cells, since apparently identical results are obtained regardless of whether rabbit blood or human blood is used. This method was officially recommended during the War (7). It consists of mixing $\frac{1}{2}$ c.c. of a 24-hour beef infusion broth culture of the organism with $\frac{1}{2}$ c.c. of a five per cent suspension of washed blood cells, and placing in water bath at 37° C. for two hours. Only those organisms are considered hemolytic streptococci which show hemolysis of the red blood cells at the end of this time. This test is especially important when dealing with throat cultures, since such cultures show a large number of doubtful hemolyzers on blood agar plates.

The throat cultures were made from the tonsils, since it has been demonstrated that they are the most frequent habitat of hemolytic streptococci (8). The swabs were inoculated on the surface of blood agar plates. After incubation for twenty-four hours suspicious colonies were picked, 24-hour broth cultures of which were later tested for hemolysis as described above. Rabbit cells were used in this test.

Pour plates were also made of the organisms isolated, as done by Smith and Brown (9), but it is believed that the results with this method are not as sharply cut as with the washed cell test.

Reference was also made in the previous publication to a gram-negative hemolytic and hemoglobinophilic bacillus. This organism was probably first mentioned in the literature by Pritchett and Stillman (10), who noted its characteristics and called it provisionally *Bacillus X*. Rivers (11) considers it as belonging to the *bacillus influenzae* group, of which he has shown there are several varieties. Stillman and Bourn (12) have described it in greater detail recently. They consider that hemoglobinophilic bacteria may be divided into two groups, hemolytic and nonhemolytic, and that influenza bacilli are not hemolytic. The organism is mentioned here merely to re-emphasize the importance of examining stained smears of all colonies before considering them streptococci. This is not so great a source of confusion when human blood agar plates are used, since the organism grows and hemolyzes much more slowly on it.

RESULTS OF CULTURES

Table I, taken from the previous report, shows the results of the throat cultures at Columbus. Recruits were cultured on the day following their arrival at the post, and again just prior to their leaving to go to their assignments, an interval of from five to thirteen days. The group comprising the permanent personnel had all had one or more years' service in the Army.

TABLE I.—*Incidence of Streptococcus Carriers among Recruits and among Permanent Personnel at Columbus Barracks, Ohio*

	<i>Number cultured</i>	<i>Number positive</i>	<i>Percentage positive</i>
Recruits arriving.....	470	79	17
Recruits leaving.....	175	28	16
Permanent personnel.....	99	20	20

It is seen from this table that the incidence of carriers among recruits having spent a short period at the post shows no increase over the rate prevailing among them on arrival, and that these rates do not differ essentially from the incidence among the permanent personnel.

The cultures at Columbus were made during February and March, 1920, and hence during the latter part of the influenza epidemic of that year, and continuing until after its subsidence. No relationship could be demonstrated between the incidence of carriers and the cessation of the epidemic. At Columbus Barracks, among an average population of approximately 1,300, there were about 110 cases of influenza, and five deaths from hemolytic streptococcus broncho-pneumonia, during January and February, 1920. Being a recruit depot with personnel constantly shifting, the cases were derived from a much larger number of people than the average population. Climatic conditions at Columbus during the course of the work were those of a very severe winter, the ground being covered with snow most of the time.

At Fort Slocum the cultures were made during the month of September, 1920, during a period of ideal late summer weather. No streptococcus disease was prevalent, except two mild cases of tonsilitis, among an average population of about 3,000. The same plan was followed as at Columbus, except that, since recruits spent a longer period of time at the depot, they were cultured three times, at intervals of from seven to twelve days between cultures. The permanent personnel had been on duty at the post six months or longer. The results are shown in Table II.

TABLE II.—*Incidence of Streptococcus Carriers among Recruits and Permanent Personnel at Fort Slocum, New York.*

	<i>Number cultured</i>	<i>Number positive</i>	<i>Percentage positive</i>
Recruits arriving.....	454	100	22
Recruits, second culture.....	350	97	28
Recruits leaving.....	157	43	27
Permanent personnel.....	150	30	20

At Fort Slocum the incidence among the permanent personnel is seen to be somewhat less than that among the recruits. However, the difference is not great enough to warrant any conclusion, although it is in contrast to the much higher incidence (eighty-three per cent) prevailing among the permanent personnel at Camp Taylor (2).

A comparison of the results at $\frac{1}{2}$ Columbus and at $\frac{1}{4}$ Slocum shows that there is no difference between the incidence of carriers among the permanent personnel, but that the recruits at Slocum show a slightly higher rate than at Columbus. In general, though, the rates are essentially the same at the two places, and any effort to draw far-reaching conclusions from slight differences would perhaps lead to error. It is worthy of note that the rate at Columbus in winter, and while experiencing an epidemic of influenza, is approximately the same as that at Slocum in the late summer, and in the absence of any epidemic disease. The cultures from both places are consolidated in Table III.

TABLE III.—*Consolidation of Cultures made at Columbus Barracks and at Fort Slocum.*

	<i>Number cultured</i>	<i>Number positive</i>	<i>Percentage positive</i>
Recruits arriving.....	924	179	19
Recruits leaving.....	332	71	21
Permanent personnel.....	249	50	20

This consolidated table shows more clearly than the separate tables that there is no difference as a whole between the incidence of carriers among the permanent personnel and recruits arriving from civilian life. Furthermore, recruits show no increase in the carrier incidence during the period that they are ordinarily detailed at recruit depots.

RELATION OF HYPERTROPHIED TONSILS TO THE CARRIER STATE

Nichols (13) has emphasized that the tonsils were the foci of localization of hemolytic streptococci in carriers and found that tonsillectomy was the surest means of removing the carrier state. He also showed that the use of drugs as gargles or inhalations had no influence. Davis (14) has also laid stress on the importance of the tonsils as foci of localization of hemolytic streptococci, and found that the carrier rate among persons who had had tonsillectomies was fifteen per cent, while that among other persons was fifty-eight per cent.

Table IV shows the incidence of streptococci among the recruits arriving at Columbus and Slocum, divided according to whether a tonsillectomy had been done or not. Cases which had been operated upon and showed large obvious remnants of tonsillar tissue were not considered as having had tonsillectomies.

TABLE IV.—*Influence of Tonsillectomy.*

	<i>Number cultured</i>	<i>Number positive</i>	<i>Percentage positive</i>
Cases without tonsillectomy. . .	896	177	20
Cases with previous tonsillectomy	28	2	7

Hence, it is evident that the number of carriers among average

individuals is approximately three times greater than that among individuals having had previous tonsillectomies.

Since the tonsils are so conclusively the habitat of hemolytic streptococci, it was desirable to ascertain if pathological conditions of the tonsils influence in any way the incidence of carriers. Table V shows the results of cultures of recruits, divided according to whether they showed hypertrophied tonsils or not.

TABLE V.—*Influence of Hypertrophied Tonsils.*

	<i>Number cultured</i>	<i>Number positive</i>	<i>Percentage positive</i>
Cases without hypertrophied tonsils	784	130	17
Cases with hypertrophied tonsils. . .	140	49	35

It is seen then that the incidence of carriers among cases showing hypertrophied tonsils is twice as great as that among other individuals. The relation of the tonsil to hemolytic streptococci is thus shown by the lower percentage of carriers following tonsillectomy and the higher number of carriers in the presence of hypertrophied tonsils. Furthermore at Slocum twice as many individuals with hypertrophied tonsils were persistently positive, that is, on all three cultures, as individuals without hypertrophy.

FERMENTATION REACTIONS

Nearly all the strains of streptococci isolated at Columbus and Slocum were tested against the four substances, lactose, mannite, salicin, and inulin, and classified according to the system of Holman. Eighty-six per cent were *Streptococcus pyogenes* (fermenting lactose and salicin); eight per cent were *infrequens* (fermenting lactose, mannite, and salicin); and five per cent were *anginosus* (fermenting only lactose). Observations in regard to the persistence of these strains in the same individual were made in the previous report (6).

DISCUSSION

In attempting to compare these results with the figures of Levy and Alexander (2) it must be borne in mind that entirely different conditions prevailed at Camp Taylor during the overcrowding attendant upon mobilization. Hence the results of the cultures here reported can be no assurance against recruit depots under certain conditions becoming more highly infected with hemolytic streptococci than civilian communities, and in turn infecting non-immune recruits arriving for duty.

Furthermore, it is obvious that a negative throat culture may only mean that the organisms are present in too small a number to be detected. This accounts undoubtedly for some of the negative cultures. Inoculation of the swab into blood broth, incubating for six hours and then

plating, detects a higher percentage of carriers than plating directly as was done in the work here reported. However, the method used is sufficiently accurate to enable comparisons to be made between the groups cultured. It is not believed that hemolytic streptococci can be considered normal inhabitants of the throat, and their detection may have great practical value. Levy and Alexander (2) have shown that carriers were much more liable to the development of the complications of measles, and that cross infection in the wards can be prevented.

The full significance of streptococcus carriers and their *exact* relationship to streptococcus disease are not wholly understood. The organisms isolated from carriers are indistinguishable by all the usual means from those isolated from disease. It is probable that carriers have an important place in the spread of streptococcus infections, and the fact that the incidence of carriers is always rather high should be no deterrent in our efforts to find means to control them.

This work re-emphasizes the importance of the tonsil as harboring hemolytic streptococci and the influence of tonsillectomy in eradicating the organisms. It is possible that complete tonsillectomy, certainly of tonsils at all enlarged, will in time come to be looked upon as one of the most important prophylactic measures against respiratory infections.

Further work is being carried on relating to the classification of these carrier strains by the reaction of agglutination. The attempt, however, presents numerous technical difficulties. Work is also being done to determine the feasibility of vaccinating against streptococci.

CONCLUSIONS

1. The permanent personnel on duty at recruit depots in time of peace does not show a higher rate for hemolytic streptococci than incoming recruits.

2. Recruits do not show an increase in the percentage of hemolytic streptococcus carriers while at recruit depots undergoing preliminary training.

3. Hypertrophied tonsils favor the development and persistence of the state of a carrier of hemolytic streptococci.

4. Tonsillectomy lessens considerably the incidence of carriers of hemolytic streptococci, and is advocated as a more general prophylactic measure.

The work reported in this paper was done with the aid and advice of Major H. J. Nichols, Medical Corps. The writer also acknowledges his indebtedness to Colonel J. S. Wilson, Medical Corps, and Colonel David Baker, Medical Corps, Surgeons at Columbus Barracks and Fort Slocum, respectively, for their aid and cooperation.

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A STUDY OF THE ARMY RATION AND ITS RELATION TO THE HEIGHT AND WEIGHT OF SOLDIERS IN ARMY CANTONMENTS

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STUDY I

IN order to find out the relation of food consumed to the height and weight of the soldiers in garrison or cantonment activity, the writer, while making a nutritional survey of some of the National Army Cantonments under authority of the War Department, thought it would make an interesting scientific study to determine such relation in addition to the required information desired by the Surgeon General's office as to the amount of food actually consumed by messes under observation.

Investigation showed that the initial height and weight of the men when they entered service could be obtained from "Card No. 88" of the enlisted man. On entering the service each man is weighed, stripped, and his height taken in bare feet. This card also gives the date of enlistment, age, and other pertinent data for government record.

At the time of making the study of the messes under observation the men had been in active cantonment duty for about four months. It can be assumed that a man between the draft age of 21 and 31 years will show the effects of the food consumed during that period of time, both as to gain or loss in either weight or height. The conditions of this four-month period from the latter part of September, 1917, to the latter part of January, 1918, were entirely normal and typical of army camp life as to training, physical exercise, and drill.

The primary object of the food survey as outlined by the Surgeon General's office was to safeguard the nutritional interests of the troops under observation.

At all the detailed Army messes studied by the writer he obtained the height and weight of about 306 men under observation while the amount of food which was actually consumed per man per day was being determined for a one week period.

The appended tabular results worked out by the writer give some enlightening information in regard to the relation of height and weight of soldiers to the amount of food actually consumed.

Table I shows the organization studied, the number of men measured and weighed, date of enlistment, average height and weight at enlistment, date when second weights and heights were taken together with

the average height and weight at that time. There is also summarized the average gain in inches and pounds over the enlistment period.

TABLE I

Organizations studied.	No. of men who were measured and weighed.	At enlistment			In service			Average gain in height in inches.	Average gain in weight in pounds.
		Date of enlistment.	Average height in inches.	Average weight in pounds.	Date taken	Average height in inches.	Average weight in pounds.		
Camp Grant, 331st Machine Gun Battalion, "C" Co.	160	Sept. and Oct. 1917	67.77	141.44	Jan. 22, 1918	68.23	145.19	0.46	4.05
Camp Dodge, 366th Inf., "A" Co. 92d Div. (colored)	99	Oct. 1917	68.15	142.56	Jan. 20, 1918	68.35	151.07	0.20	2.57
Camp Funston, 356th Inf., "E" Co.	107	Sept. and Oct. 1917	68.17	138.27	Jan. 30, 1918	68.57	149.07	0.40	10.80
* Averages—306		Oct. 1917	68.02	142.74	Jan. 1918	68.32	148.54	0.35	5.80

* Age average at Camp Dodge Company = 25.6 years.

Age average at Camp Funston Company = 24.7 years.

Table II shows the food consumed per man per day in grams protein, fat, and carbohydrate; food consumed per kilogram body weight in grams protein, fat, and carbohydrate; total calories consumed per man per day; the calories of basal metabolism (Du Bois Formula); remaining calories; per day hours active work per man; and date of study.

Table III gives the height gain per man per day in centimeters; height gain per man per day in centimeters per kilogram of protein consumed; weight gain per man per day in grams; weight gain per man per day per 1,000 calories consumed; average total variation from normal weight (grams) using Gaudier's formula; per man per day per cent relation gain height divided by centimeters gain height per kilogram protein consumed; per man per day per cent relation weight (grams) per 1,000 calories consumed divided by the grams gain in weight; per man per day per cent relation protein calories consumed divided by total calories consumed; and per man per day per cent relation fat calories consumed divided by total calories consumed.

Table IV gives total hours active work in seven-day study; kind of work done; previous average occupation before joining U. S. Service;

TABLE II

Organizations studied	Food consumed per man per day			Food consumed per kilogram body weight			Total calories consumed per man per day.	Calories, basal metabolism (Dufflois formula).	Calories, mechanical work, metabolism (Benedict's factor).*	Remaining calories.	Per day active work per man in hours.	Date studying mess.
	Protein grams.	Fat grams.	Carbohydrate grams.	Protein grams.	Fat grams.	Carbohydrate grams.						
Camp Grant 331st M.G.B. "C" Co.....	127	150	490	1.92	2.27	7.42	3924	1728	845	1351	4.5	Dec. 29, 1917, to Jan. 4, 1918.
Camp Dodge 366th Inf. colored "A" Co..	117	110	480	1.71	1.60	7.00	3471	1776	713	982	3.8	Jan. 6, 1918, to Jan. 22, 1918.
Camp Funston 356th Inf. "E" Co.....	149	93	538	2.21	1.37	7.95	3682	1757	826	1099	4.4	Jan. 30, 1918, to Feb. 5, 1918.
Averages.....	131	118	503	1.95	1.75	7.46	3692	1754	795	1143	4.2	Jan. 1918.

* The average factor used is 3.13 calories per minute and is Benedict's and Murschhauser's result for the influence of mechanical work on metabolism of a man standing and swinging arms in rapid walking, and will probably be the calories of metabolism utilized for the work done by the enlisted men studied.

average locality where resided before joining U. S. Service; and average weather conditions at time of study.

A study of the above-mentioned tables shows a similar per cent relation per man per day by dividing the centimeters gain in height by the centimeters gain in height per kilogram of protein consumed. The average figure is a little over 13 per cent. There is likewise a similar per cent relation per man per day by dividing the grams gain in weight per 1,000 calories consumed by the grams gain in weight. This figure averages a little over 27 per cent.

A similar relation is found as to the food consumed per kilogram of body weight—averaging 1.95 grams protein, 1.75 grams fat, and 7.46 grams carbohydrate.

There seems to be an apparent relation in each mess studied between the total number calories consumed, the total average gain in height, the gain in height per kilogram of protein consumed, the hours active work, the wind velocity, and the remaining calories after basal metabolism and metabolism due to work are subtracted. For example, if a larger number of total calories are consumed per man per day the greater is the average gain in height per kilogram of protein consumed;

more food is eaten when more active work is done, and from these figures the greater the wind velocity more food is consumed.

As to previous average occupation before joining U. S. Service, these results show that former clerks or those formerly doing sedentary work consumed more food per day than those formerly doing farming or previously acting as laborers.

Some interesting instances of individual growth may be mentioned.

N. C., an Italian in "E" Co., 356 Infantry, Camp Funston, a cabinet-

TABLE III

Organizations studied	Height gain per man per day		Weight gain per man per day.		Average total variation from normal weight (grams) (Gautier's Formula). *	Percentage relation per man per day; cm. gain height ÷ cm. gain ht. per kg. protein consumed.	Percentage relation per man per day; gain wt. gms. per 1000 calor. cons. ÷ gms. gain wt.	Per man per day, percentage relation protein cal. con. ÷ total cal. consumed.	Per man per day, percentage relation fat cal. con. ÷ total cal. consumed.
	Centimeters gain.	Cm. gain per kilogram protein consumed.	Grams gain.	Grams gain per 1000 total calories consumed.					
Camp Grant, 331st M. G.B., "C" Co.	0.0097	0.0764	15.32	3.90	+ 553.9	12.70	25.46	13.26	35.55
Camp Dodge, 336th Inf. "A" Co., (colored)....	0.0442	0.0359	9.72	2.80	+2787.6	11.70	28.81	13.83	29.47
Camp Funston, 356th Inf., "E" Co.	0.0085	0.0570	40.86	11.10	+1330.2	14.91	27.17	16.59	23.49
Averages.....	0.0071	0.0564	21.97	5.93	+1557.2	13.10	27.15	14.56	29.50

* Gautier's formula is as follows: (Height, inches—42.00) 5.5 = Normal weight of an adult.

This gives the normal weight of an adult and variation may be found by subtracting actual weight at time of studying mess. This was then reduced to grams.

maker by trade, did not gain anything in height but made a gain of 7 pounds in weight from September 5, 1917, to January 30, 1918. In this same company were two Mexicans, Pablo and Paco L., brothers, who are interesting examples of extremes in both gain in weight and height. Pablo gained 1.25 inches in height and 5 pounds in weight, age being 25 years, from September 19, 1917, to January 30, 1918. In the same time, Paco gained one inch in height and 42 pounds in weight, age being 29 years. Pablo was originally 67 inches in height and weighed 141 pounds. Paco was originally 65 inches in height and weighed 134 pounds.

Another Mexican, R. V., from this same company at Funston, had an initial height of 62.5 inches and a weight of 107 pounds, September 5, 1917. He was 22 years old and a gain in height of one-half inch and a gain in weight of 13 pounds up to January 30, 1918, was noted.

A. E. C., of the Funston Company, formerly of Kansas City, Mo., and who in private life conducted a cigar store and poolroom, made no gain in height but did make a gain of six pounds in weight from September 19, 1917, to January 30, 1918.

Two brothers in "C" Co., 331 Machine-Gun Battalion, Camp

TABLE IV

Organizations studied	Total hours active work in 7 day mess study.	Kind of work done.	Previous average : occupation before joining U.S.service	Average locality where men resided	Weather conditions at time mess was studied			
					Mean temperature.	Relative humidity (average).	Wind velocity (average).	Barometer (average)
Camp Grant, 331st M. C. B., "C" Co.....	31.5	Physical training; drill for precision and snap; practice march; standing at inspection; machine gun drill; malfunctions of machine gun; target designations; first aid; signaling; athletics.	Clerks, office work, and indoor work.	Chicago, Ill., and vicinity	11.3	66.6	14.1	30.20
Camp Dodge, 366th Inf. "A" Co. (colored)....	26.5	Practice march; manual of arms; sighting and aiming drill; position and aiming drill; physical training; and close order drill.	Laborers and farmers.	Alabama negroes and a few negroes from north states.	11.1	79.9	7.9	30.05
Camp Funston, 356th Inf., "E" Co.....	31.0	March discipline; preparation for field firing; open and trench warfare; grenade; bayonet; close order drill; physical training; and obstacle course.	Clerks, office work, and other sedentary occupations.	Kansas City, Mo and St. Louis, Mo.	14.4	.....	9.9	29.11

Grant, E. A. N. and F. N., give an interesting example of a heavy weight and a light weight which practically went to the same weight after a period of nearly four months of army mess. E. A. N. weighed 178 pounds at enlistment and 168 pounds on January 22, 1918, while

F. F. N. weighed 130 pounds at enlistment and 163 pounds January 22, 1918.

A few variations in the weight of the members of "A" Co., 366th Infantry (colored) might be mentioned. For instance, Sergeant C. B. H., a graduate of Drake University, and evidently of sedentary occupation, had an enlistment weight of 160.25 pounds, and after being in service for practically four months weighed 155 pounds—a loss of 7.25 pounds. His height is 69 inches and age 29 years. An example of large loss of weight in this colored company is Corporal W. W., who weighed 174 pounds on October 26, 1917, and only 139 pounds January 20, 1918. His height is 64.5 inches. In spite of a few individual cases of this kind, probably due to former occupation and excess feeding, the majority of this colored company averaged a gain of 2.57 pounds by army feeding and proper exercise. Perhaps it would be of value to note that the non-commissioned officers averaged a loss of nearly two pounds for corporals and an average gain of a little over 1.5 pounds per man for sergeants.

In regard to the increase in height as a matter of growth in the proper sense of the term, it would be difficult to say in any case how much a man can increase his stature by taking thought of how he carries himself. But these results and further studies to be reported have a tendency to show that there was a uniform gain in height in accordance with the food consumed and that the increase in height was not all due to more erect carriage.

STUDY II

In the previous study, the weights and heights of some 300 soldiers in different army camps were reported and a comparison made with the food actually consumed. The weights and heights at time of enlistment were also given to show growth as benefited by the army ration and army camp or rather army cantonment activity. These results and tables of growth are further substantiated by a further study at Camp Zachary Taylor, Ky.

In this study at Camp Zachary Taylor, in addition to substantiating the results already reported, a particular study was made as to occupation before enlistment and nationalities represented. These results are found tabulated in the appended data.

Farmers (previous occupation) made an average gain in weight of 10.50 pounds; salesmen, a gain of 3.17 pounds; clerks, a gain of 5.50 pounds; students and teachers, a gain of 1.50 pounds; hard workers, such as sawyer, miner, railroad fireman, steam shovel fireman, car loader, teamster, driver, and laborer made an average gain in weight of 11.63;

medium workers, such as telephone installer, guard, stationary engineer, paper hanger, photo-engraver, and foreman of bottling works made an average gain of 6.97 pounds; while one banker studied made a loss of 2.00 pounds in weight, and two bartenders made an average loss in weight of 12.25 pounds. This was within a period of about six months in army training camp, with a subsistence of the army ration.

Relative to nationality in this particular E Company, 336th Infantry, Camp Taylor, Ky., 40.31 per cent were of Irish descent, 24.19 per cent of German descent, 32.26 per cent of English or "American" descent, 1.61 per cent of French descent, and 1.61 per cent of Dutch descent. The details are shown in the appended table.

Especially interesting is the food consumed per kg. body weight, which seems to be relatively constant in all messes studied by the writer and previously reported by the writer in Study I. This E Company, 336th Infantry, Camp Taylor, Ky., study data is no exception and agrees with the other data. Perhaps it would be well to summarize this data again and give the Camp Taylor data for comparison:

Study company at	Number of individuals	Per man per day—food consumed per kilogram body weight		
		Protein	Fat	Carbohydrate
		<i>Grams</i>	<i>Grams</i>	<i>Grams</i>
Camp Taylor, E Co., 336th Inf...	62	2.57	2.58	8.12
Camp Grant, 331st M.G.Battalion	100	1.92	2.27	7.42
Camp Dodge, A Co., 366th Inf...	99	1.71	1.60	7.00
Camp Funston, E Co., 356th Inf...	107	2.21	1.37	7.95
Average.....		2.20	1.96	7.62

TABLE I

Occupation before enlistment.	Average in service.		Average before enlisting.		Average age.
	<i>Pounds</i>	<i>Inches</i>	<i>Pounds</i>	<i>Inches</i>	<i>Years</i>
Farmers	151.95	68.45	141.45	68.51	24.3
Salesmen.....	131.67	66.00	128.50	65.75	22.8
Clerks.....	136.33	67.25	130.83	66.00	22.0
Barber.....	132.00	69.50	.....	69.00	24.5
Bartenders	172.00	68.25	184.25	67.75	26.8
Hard workers, such as 1 sawyer, 2 miners, 1 Railroad fireman, 1 steam shovel fireman, 1 carloader, 1 teamster, 1 driver, and 2 laborers.....	159.70	69.35	148.07	69.10	24.0
Sedentary workers such as 2 students and 1 teacher..	139.33	66.75	127.83	65.88	22.5
Banker.....	157.00	66.00	159.00	66.00	30.0
Medium workers, such as 1 telephone installer, 1 guard, 1 stationary engineer, 1 paperhanger, 1 photo-engraver, and 1 foreman bottling works.....	149.67	66.10	142.70	65.90	25.7
Average of all..... (Except the weights of bartenders.)	144.71	67.52	139.77	67.10	24.7

Average gain in weight = 4.94 lbs.

Average gain in height = 0.42 inches.

Variation from normal (Gaudier's formula) = 4.29 lbs.

TABLE II.—*Nationalities Represented.*

Descent	Number	Percentage
Irish.....	22	40.32
Irish-German.....	1	
Irish-Scotch.....	1	
Irish-English.....	1	
German.....	11	24.29
German-English.....	3	
German-Austrian.....	1	
English.....	10	32.26
"American" (English).....	10	
French.....	1	1.61
Dutch.....	1	1.61
Total.....	62	100.00

TABLE III.—Occupation Before Enlistment.

Previous occupation	Number	Classification	Percentage Classification
Farmers.....	33	Heavy workers	69.35
Sawyer.....	1	“ “	
Miners.....	2	“ “	
Firemen.....	2	“ “	
Carloader.....	1	“ “	
Teamster and drivers.....	2	“ “	
Laborers.....	2	“ “	9.68
Telephone installer.....	1	Medium worker	
Guard.....	1	“ “	
Stationary Engineer.....	1	“ “	
Paper hanger.....	1	“ “	
Photo-engraver.....	1	“ “	
Foreman, bottling works.....	1	“ “	4.82
Bartenders.....	2	Light workers	
Barber.....	1	“ “	
Salesman.....	3	Sedentary	16.13
Clerks.....	3	“	
Students.....	2	“	
Teacher.....	1	“	
Banker.....	1	“	

TABLE IV.—Comparison With Previous Work.*

Study company at	Calories consumed	Calories basal metabolism (Dubois Form.)	Calories mechanical work. (Benedict's form.)	Calories remaining
Camp Zachary Taylor.....	4461	1680	1069	1712
Camp Grant*.....	3924	1728	845	1351
Camp Funston*.....	3682	1757	826	1099
Camp Dodge (colored)*.....	3471	1776	713	982

Study company at	Average gain weight pounds	Average gain height inches	Average variation gm. gain from Normal weight. (Gaudier's form.)
Camp Zachary Taylor.....	4.94	0.42	1947.7
Camp Grant*.....	4.05	0.46	553.9
Camp Funston*.....	10.80	0.40	1330.2
Camp Dodge (colored)*.....	2.57	0.20	2787.6

Study company at	Per day, hours active	Percentage relation	
		Centimeters gain height per kg. protein consumed	Gain weight grams per 100 calories consumed.
Camp Zachary Taylor.....	5.4	16.89	22.40
Camp Grant*.....	4.5	12.70	25.46
Camp Funston*.....	4.4	14.91	27.17
Camp Dodge (colored)*.....	3.8	11.70	28.81

* See height and weight data—Study I.

STUDY III

In two previous studies the writer showed the relation of the height and weight of soldiers in army cantonments to the amount of food actually consumed. This study now presented attempts to show the basal metabolism (Du Bois Formula) of the men on entering the service, grouped according to previous occupation. The appended tables give this data relative to 474 recruits in the 158th Depot Brigade, Camp Sherman, Ohio. The Recruit Companies studied were the 34th and 35th, respectively, in the 9th Training Battalion.

It was thought by the writer that perhaps it might be of value in grouping such initial height and weight data according to previous occupation to see whether men of various occupations could be classified as to similar heights and weights.

The following table made out from classified data gives the average age, height, actual weight, normal weight, and basal metabolism of the recruits as they arrived in the army cantonment, grouped as to previous occupation before being drafted into the service:

Previous occupation	Average age	Average height inches	Average weight pounds	Average basal metabolism (Dubois)	Number studied	Average normal weight, pounds (Gautier's formula).
Farmers.....	25	68.3	139	....	37	...
Laborers.....	26	65.9	142	....	41	...
Miners.....	25	68.3	142	....	16	...
Firemen.....	24	69.8	147	....	8	...
Miscellaneous hard workers..	25	67.0	139	....	49	...
Total hard workers.....	25	67.7	142	1699	151	141
Iron workers.....	26	66.1	139	....	40	...
Machinists.....	26	67.3	142	....	40	...
Carpenters.....	27	67.5	140	....	18	...
Painters.....	27	65.9	132	....	12	...
Total medium workers....	26	66.7	139	1647	110	136
Printers, pressmen.....	25	68.2	131	....	13	...
Electricians.....	25	65.9	135	....	36	...
Waiters and cooks.....	26	68.5	147	....	14	...
Grocers.....	24	65.8	146	....	8	...
Merchants (miscellaneous)...	25	65.7	143	....	25	...
Plumbers.....	27	66.7	143	....	5	...
Total medium light workers	26	66.8	141	1671	100	136
Clerks.....	25	67.2	132	....	51	...
Barbers.....	27	66.3	132	....	5	...
Managers, foremen.....	25	68.1	151	....	17	...
Instructors, students.....	25	65.7	143	....	9	...
Bell hops.....	26	68.1	141	....	4	...
Total light workers.....	26	67.1	139	1661	86	138
Bartenders and saloon keepers	26	69.0	178	....	4	...
Trainmen.....	27	66.5	138	....	5	...
Seamen.....	28	66.5	142	....	2	...
No occupation.....	27	66.5	152	....	26	...
Sedentary and others.....	27	67.5	161	1752	37	140
General average.....	28	67.2	144	1690	474	139

The food consumed per man per day for these recruits averaged 3,500 calories during the ten or so days studied after they arrived in camp. This is not materially different from the amount of food consumed by men who had been in the service three or more months.

Special attention is invited to the similarity of average normal weight (Gautier's Formula) and the actual average weight as the men were weighed on reaching the camp. An exception to this rule is found by noting the average actual weight of bartenders, saloon keepers, and those giving no occupation and comparing this weight with the average normal weight as found by Gautier's Formula. It is therefore seen that Gautier's Formula is based on the average weight of normal adults doing work.

There is a similarity of the average weight of farmers, laborers, miners, and other occupations. Future studies will probably show that those doing similar work have a similar weight.

Average figures of 474 recruits show 26 years of age, height 67.2 inches, 144 pounds in weight, basal metabolism 1,690 calories, and an average normal weight (Gautier's Formula) of 139 pounds.



MALARIAL FEVERS

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THE title of this article takes in considerable territory but it is not the intention of the author to burden the reader with a detailed account, from definition to treatment, of the various malarial fevers. This short paper is written with a view of emphasizing the desirability of always keeping in mind malarial infections as the causative factor of untoward symptoms in cases that otherwise, from a symptomatic viewpoint, call for no ague treatment.

In Bangkok the conditions are ideal for the spread of practically all kinds of mosquito-born diseases, with special reference to malaria; yet the laity and even many of the medical men still maintain that "In Bangkok we have no paludism, only up-country do you find it!"

In one of the charity hospitals under the supervision of the medical officer more than a thousand patients are treated monthly, both surgical and medical, and from a continuous and close observation it has been found very advisable to administer quinine to practically every case.

The great majority of all patients treated are from Bangkok proper, many of them never having been out of the city. A series of blood examinations at various times shows an average of 25 per cent harboring parasites in the peripheral circulation, and of these 10 per cent are pernicious subtertian. It behooves one to make careful blood investigations.

SYMPTOMATOLOGY

The great majority of all cases are simple tertian and cause but little trouble, responding as a rule to oral therapy and running a short course. These cases have been relighted and started burning, as it were, by some inter-current accident, either medical or surgical, as a rule surgical. From a symptomatic standpoint there is nothing of interest in this type of case. It simply goes to show that, contrary to the general opinion harbored by many people living in a malarious country that there is no danger, it is really necessary to constantly practice the principles of preventive medicine with the greatest energy and zeal.

The following three cases are reported for two reasons: First, to show that a pernicious type of malaria is prevalent, and, second, to illustrate the localization of the parasite in this type of the disease.

Subtertian fever depends for its symptoms upon *Laverania malariae*. The infection may be typical, in which case the diagnosis is not so

difficult because the parasite is much easier to demonstrate in the peripheral circulation and the temperature chart is more or less typical. On the other hand, the infection may be atypical, in which case the problem is an entirely different one. This is so for the reason that the subtertian parasite can pass its entire life history in the internal organs and very often does. As a result any organ or system of the body may become the special target of the infection and in turn any disease, acute or chronic, may be imitated. Therefore, a negative blood is without value.

The classification of typical subtertian fevers is simple compared to the classification of the atypical ones. Under the first we may have the following: 1, simple subtertian; 2, double subtertian; 3, mixed subtertian. Under the second we have subtertian with localization and without localization. The cases without localization may resemble acute infectious disease, acute intoxication, or other obscure physiologic derangement. The cases with localization are too numerous to specify, but may be arranged according to system or organ, such as nervous, digestive, ductless gland, etc.

CASE 1.—On the first of October, 1920, an Indian appeared in the out-patient department of the hospital for treatment. He had just arrived in the city, having walked overland from Burma. His previous history was negative in so far as it could be accounted for. His present history was not enlightening. He complained of fever, but no chills, and said he felt sick all over. Physical examination revealed a fairly well preserved body with no abnormalities. The spleen was not enlarged. Patient put to bed. Urine examination negative. Blood examination negative for hemamoeba or signs of the same. White count, 12,000. Patient not doing well, restless. Temperature irregular. Treatment expectant with quinine grains ten t.i.d. Second day patient comatose and on the morning of the third day died. Continuous blood examinations failed to show parasites. The post-mortem examination was practically negative except for severe congestion of the brain. The spleen was quite normal in appearance. It is interesting to note that blood taken from the cerebral capillaries was fairly loaded with subtertian parasites.

CASE 2.—A Bangkok-born Chinese, aged 21, appeared in the out-patient department of the hospital for treatment, having been carried to the hospital by his friends. He was at once put to bed and examination revealed the following: The patient presented evidence of severe hyperesthesia. There was a slight convergent strabismus. It could not be ascertained whether this was present previous to his illness or not, as the patient was quite delirious and his friends seemed quite

ignorant of any previous history. There was severe rigidity of the neck; the patient could quite easily be lifted from the bed by exerting pressure on the back of the head. Kernig sign present and marked. Spleen quite normal in so far as examination was possible. Other physical examination negative. Provisional diagnosis of meningitis of unknown etiology. A blood examination made at once showed a white count of 8,000. A slide showed a marked subtertian infection. Specific treatment resulted in complete recovery in forty-eight hours, the patient refusing to remain longer in the hospital, stating he was not sick.

CASE 3.—A native Siamese, born and raised in the city of Bangkok, age about thirty, arrived, assisted by his friends, in the out-patient department of the hospital, for treatment. A physical examination revealed a well-marked polyneuritis of the lower extremities of quite recent development. No edema. Spleen and liver normal, other physical examination negative. Patient seemingly quite rational, but unable to answer questions intelligently, with special reference to his present illness. His immediate past history seemed very vague in his memory, and a more intensive mental examination, combined with his motor polyneuritis, led to the diagnosis "malarial psychopolyneuritis, Korsakoff in type." The patient was put to bed, and a blood examination showed a white count of 9,000. Slide negative for hemamoeba or signs of the same. Patient given urgent anti-malarial treatment combined with anti-beriberi therapy, and made an uneventful and complete recovery in four days.

TREATMENT

Nothing new can be added regarding the treatment. Satisfactory results are obtained in the native by the proper use of quinine without recourse to the more recent specifics such as the organic compounds of arsenic and others. This is not always the case in the white man who has been in the country some time and has been doping himself more or less continuously with quinine. Seemingly the native is virgin ground for quinine the same as the white man is for the parasite. In conclusion, suffice it to state that it always pays to treat every patient as suffering from malaria until the said patient has left the confines of the hospital. This is a dogmatic statement, but will be appreciated by medical men working in a malarious country.

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Original articles, items of news and matter of interest to the Services are welcomed. Requests or reprints should be made at the time of forwarding articles.

EDITOR,

COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

OF INTEREST TO OFFICERS OF THE MEDICAL RESERVE OF THE ARMY

We are publishing this month in the section devoted to Comment and Criticism information relative to the affairs of the Reserve Corps of Army. This information was compiled in the Office of the Surgeon General of the Army by officers concerned with the Reserve Corps, and was selected with a view to its helpfulness to members of this branch of the service. It is our intention to publish, possibly from month to month, further material of a like character with the same object in view, that of keeping Medical Reserve officers of the Army in touch with topics of special interest to them. It is hoped that this innovation may be of practical use.

ETYMOLOGICAL AND OTHER ABUSES

"For we aren't no thin red 'eroes."—*Kipling*.

There are fashions in diction as well as in apparel. The style in which we dress our thoughts is as much subject to change as that which governs the clothing of our bodies.

And it is publicity which sets up and tears down both standards. The inspired mannequins who parade the race course at Chantilly or decorate the beach at Trouville carry to the public the edicts of the modistes of Paris. The public press spreads abroad some clever catch

phrase or accentuates some hitherto inconspicuous word, and hence one is on our backs and the other in our mouths.

As a consequence, we have high skirts and low skirts: high waists and low waists, and even as the variant approaches its limit, no waists at all. So, also, we have filled our eyes and mouths and ears with "innocuous desuetude," "the Big Stick," and "watchful waiting." We have "stressed" things *ad nauseam*, overworked the "meticulous," and run the gamut of the dictionary.

Some of the styles have been good, other less satisfactory: therefore some have come to stay, and others, thank fortune, are as transitory as the Ephemeridae.

Just at present, by edict of our word-fashioners, we are all "Heroes," with a very large H. It is perhaps a natural post bellum consequent, but is it, on the whole, an entirely logical and satisfactory status, especially when it carries more of empty honor than material benefit? We read constantly of wounded heroes and returned heroes; of ill-treated heroes; heroes of every state of mind from deep disgust to moderate complacency. If we accept the line of reasoning intimated in these quotidian reports, all that is essential to construct a hero is a man and a completed term of enlistment or commission in the Federal service. There *are* "heroes," of course, thank God, and none of us will ever hesitate to give them the honor which is their due; but to elevate each individual of the fighting forces of the country to this pinnacle would leave us in the position of the Governor's staff, where colonels and lieutenant colonels predominate to the exclusion of anything of lesser rank and equal utility.

After all, the thing resolves itself into a question of equity and common sense. The Bible says that "The wages of sin is death." In a varying degree, that is the wage of the fighting man on land and sea the world over. He is the egg that must be broken to make the international omelette, and while, with the cheerful optimism which is innate in those who go to war he always expects to come through unscathed, he is none the less cognizant of the sinister possibility which lurks at the back of his enterprise.

This is the chance which he takes; which he is paid to take; and it makes no difference in the concept whether his pay be the amount on the pay roll, or the satisfaction of a zest for adventure. All of us who fight are paid. For the man in the regular service it is compensation for a chosen vocation. For him who volunteers or is drafted it is a service paid because it is desirable that he furnish his quota in this manner rather than be taxed for the maintenance of a constant, standing fighting force sufficient to cope with the emergency of any war. Reduced

to terms of materialism, the civilian taxpayer chooses to take the chance of occasional service with the colors rather than contribute to the upkeep of a number of mercenaries. He has his choice of the two means and elects that which appears most desirable. This does not predicate that there is any lack of patriotism in his response to the call for national defense, any more than it excludes this same motive in the mind of those who fight for a living. It may sound sordid, but it is nevertheless true, that war is either a question of conquest or one of defense; and in either event the interest or safety of the individual is definitely a part of that whole of which he is a fraction, and he, as well as his country, has a very distinct personal interest in the outcome of the issue.

No man who has served can have anything save satisfaction in reflection on the fact; but there can be little doubt that as a class he must be at least bewildered in being elevated from the station of a good citizen who has striven for his own betterment as well as that of his country to a sort of superman—the “hero,” who in mythology was a product midway between the gods and mere humanity. The Greeks even worshipped the “Hero Iatros” or “heroized-physician,” but they were individualists in everything, and their Heroi Iatroi were chosen of the best as evidence of their reputation for discriminating intelligence.

If the country owes us things as a result of war service, why not ask for them on the plain grounds of debit and credit rather than as a reward for very extraordinary duty? If it were left to the individual who is most concerned this would certainly be the basis; but for the time being, at least, he must be patient in his exploitation under a caption which will persist until the phrase-formers find something newer to take its place.

Concurrent with the employ of this term “hero” is the common, and often uncomplimentary, use of the term “ex-” as applied to those who have been members of the armed forces for any brief time. The unfortunate degenerate who has been guilty of murder, arson, rape, or any of the crimes against person or property is widely heralded as an “ex-Army Officer,” an “ex-Sailor.” What is the inference we are to draw? That his crime was *propter hoc*? Common sense would seem to controvert that and to suggest that it might be as enlightening to quote the fact that the accused was an “ex-” plumber or blacksmith, and yet such is not the custom. When we commit crimes in the Army, Navy, or Marine Corps, as we sometimes do, alas! we are held up to public indignation for exactly what we are, soldier, or sailor or “devil dog.” We are never given the benefit of the fact that we are “ex-” civilians, which is quite as true as a theorem as the reverse which finds so much favor in the daily print.

There is a world of truth in Mr. Kipling's lines,

"We aren't no thin red 'eroes, nor we aren't no blackguards, too,
But single men in barricks, most remarkable like you;
An' if sometimes our conduct isn't all your fancy paints,
Why single men in barricks don't grow into plaster saints;"

Why not accept us for what we really are in accordance with the above and neither raise us to undeserved Olympian heights nor cast us out into the Biblical outer darkness as companions of all the undesirable characters chronicled as residing there?

JAMES ROBB CHURCH.

ANAPHYLACTIC SHOCK AS A CURATIVE MEASURE

Up to the present time anaphylactic shock has been regarded as one of the untoward incidents of serotherapy, and it gives a decidedly new slant to the question to have it brought forward as a possible curative measure in certain affections.

Arloing, Dufour, and Langeron¹ report a series of experiments on guinea pigs in which they apparently found that those sensitized with normal horse serum and then subjected to infection by *b. pyocyaneus* were protected against its action by a second subdural provocative injection of the horse serum.

They cite three series of experiments. In the first, four control animals were inoculated subperitoneally with one-third c.c. of a 48-hour bouillon culture of *pyocyaneus*, and all died within thirty-six hours from septicemia with positive blood cultural findings. At the same time, seven guinea pigs were sensitized with two c.c. of horse serum subcutaneously and the same amount in the peritoneal cavity. Six hours after they had been inoculated with the same dose of *pyocyaneus* as the controls they received, subdurally, a provocative dose of horse serum, and with the exception of one which died within twenty-four hours all survived. Six days later these survivors were again inoculated with the same dose of the *pyocyaneus* with no toxic effect. They gave a rate of agglutination varying from plus 50 to plus 500. Blood examination from cardiac puncture of one of these animals showed absence of the bacillus.

In the second series, four control animals were used, two of which died. Of the nine which were sensitized, four died; two probably from unusually severe anaphylactic shock, and two possibly because their condition was complicated by advanced pregnancy. Blood examination in all the survivors showed the presence of the bacillus.

¹ F. Arloing, A. Dufour, and L. Langeron. Influence curatrice du choc anaphylactique dans certaines infections experimentales. *Bull. Acad. de Med.*, No. 8 (Feb. 22), 1921.

In the third series, all five of the controls died, but the sensitized, eight in number, survived, and in the only one examined the blood was negative.

In summing up their experiments the writers show a mortality of 76 per cent for the controls and of 20 per cent for those sensitized. If allowance be made for the two pregnant animals which died, this is further reduced to 12 per cent.

From these results they conclude: that anaphylactic shock under the conditions of their experiment is capable not only of preventing a septicemic infection due to the *b. pyocyaneus*, but of curing it; that this curative action results from a rather severe shock as well as those of light degree, such as are usually encountered clinically; that the result of the shock is not only clinical cure of the disease, but sufficient to sterilize the blood and confer on the animal immunity as respects the particular infecting organism.

They state that their attention was drawn to this matter through a similar reaction observed in an infant suffering from cerebrospinal meningitis and reported by Weill, Dufour, and Bertoye.²

² Weill, A. Dufour and Bertoye. Heureuse influence d'un choc anaphylactique provoqué involontairement sur l'évolution d'une méningite cérébro-spinale a forme pyrétique cachectisante. C. R. Lyon Médical, 10 June, 1920.

JAMES ROBB CHURCH.



ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, April 1, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Army

Major

S. Weston Corbin

Captains

Harry A. Clark

Ernest Harold King

Rudolph J. E. Oden

Charles B. Sprint

First Lieutenants

Hampton Morgan Barker

Daniel Franklin

Charles F. Shook

Medical Reserve Corps, U. S. Army

Lieutenant Colonel

Wm. Fontaine Lippitt

Majors

Jo C. Alexander

John A. Hale

George A. MacIver

Captains

George E. Fosberg

Walter John Jones

V. Pleth

First Lieutenant

Walter Ray Limbaugh

Medical Corps, U. S. Navy

Lieutenants

Roger D. Mackey

Paul Rexford Neal

Medical Corps, U. S. Naval Reserve

Force

Lieutenant Commander

Carl P. Jones

Lieutenants

Roscoe Hayes Brown

Leon Clemmer

John David Coons

Edmund L. Finley

Clement Fischer

George O. Hartman

Adam Phillips Leighton, Jr.

Sigma Van Lewis

John R. Littlefield

Francis J. O'Brien

U. S. Public Health Service

Assistant Surgeon

Leon Ingraham Oppenheimer

Acting Assistant Surgeons

Alan D. Knisely

Oswell E. Morin

Medical Corps, Oklahoma National

Guard

Major

Walton Forest Dutton

Medical Corps, Texas National Guard

First Lieutenant

John J. Dunning

LIFE MEMBER

Medical Corps, Illinois National

Guard

First Lieutenant

Leon J. Heldring-Fabricius

ASSOCIATE MEMBERS

Dental Corps, Texas National Guard

Captain

Joseph Brown Jackson

Dental Corps, Massachusetts

National Guard

Major

Frank R. McCullagh

THE BOSTON MEETING

We desire to call attention again to the Annual Meeting of the Association which, as has been already announced, will take place June 2-4 in Boston, with headquarters at the Copley-Plaza Hotel and the meetings in the Swiss Room there. As the date of the meeting immediately precedes that of the convention of the American Medical Association, it gives an opportunity to be present at both during one trip, and it is hoped that this may lead to a full attendance of the members of our Association. The tentative program so far arranged is as follows:

Three addresses by members of the U. S. P. H. Service.

Remarks on the Neurology of Syphilis: Lieut. Commander R. Sheehan, M.C., U.S.N.

Syphilis: Lieut. Commander C. S. Stephenson, M.C., U.S.N.

Medical Aspects of Naval Aviation: Doctor Neuberger, U.S.N.

Some Lessons of the World War in Medicine and Surgery from the German Viewpoint: Lieut. Commander W. S. Bainbridge, M.C., U.S. N.R.F.

Dispersion of Bullet Energy in Relation to Wound Effects: Col. Louis B. Wilson, M.R.C., U.S.A.

The Recent Prevalence of Influenza and Its Preventive Inoculation in the Japanese Navy: Surg. Commander Yasuzaemon Hori, I. J. Navy.

Address by Maj. Arvine E. Mozingo, M.R.C., U.S.A.

Address by Maj. E. E. Hume, M.C., U.S.A.

Address by Col. J. E. Goldthwait, M.R.C., U.S.A.

Address by Lieut. Col. E. F. Ruffner, M.R.C., U.S.A.

Address by Maj. F. J. Cotton, M.R.C., U.S.A.

Invitations have been sent to a number of the allied countries, and representatives are expected from them. As has been the custom in the past, the papers read at the meeting will be subject to discussion by those present. It is hoped that the members of the Association will inform any medical men who are not members of the Association that they are invited to be present at any of the sessions of the Association. There will be no further opportunity to publish notice of this meeting, as the June issue of *THE MILITARY SURGEON* will not appear in time to permit of this.

Preliminary Report on Subordinate State Societies

ORGANIZATION OF THE ASSOCIATION OF MILITARY SURGEONS OF ILLINOIS

At the last (New Orleans) meeting of the Association the undersigned was appointed chairman of a committee on the organization of

subordinate State Associations to be formed as branches of the National body.

Accordingly, a number of prominent medical officers residing in diverse States were approached by correspondence, but so far without definite results.

Reports came in that sentiment at present was not in favor of medico-military activities of any kind. One distinguished medical officer writes that he has encountered great difficulties in obtaining medical officers to fill the required positions in the National Guard of his State, as proof that the "customary" reaction following a war has not yet subsided.

Accordingly, the writer determined to make a survey in Chicago, with the result that he came to the following conclusions:

1. The reaction is subsiding.
2. The majority of non-enthusiasts are still nursing fancied griefs, disappointments, and disillusiones experienced during the last war.
3. The majority of the members of the medical profession are intensely patriotic and all that is needed to arouse that enthusiasm is to point out the great need of war-preparedness.

A few days before March 17, the *Bulletin* of the Chicago Medical Society contained a notice of a meeting of the proposed Association of Military Surgeons of Illinois at a local hotel.

Between the date of announcement and meeting a number of former officers called me on the phone stating their inability to attend, but desiring to be enrolled.

The meeting itself was well attended and a success from the start.

A brief address pointing out the problems of the day and the future was responded to by a *viva voce* vote to organize permanently and to hold monthly meetings in Chicago and one annual meeting in some city down State.

The following elections were unanimous:

GUSTAVUS M. BLECH, *President*

WM. MCILWAIN THOMPSON, *Vice-President*

JAMES J. MCKINLEY, *Treasurer*

ALFRED DE ROULET, *Secretary*

A committee to draft a constitution and by-laws was appointed. This will not vary much from the one of the National body. Annual dues have been set at two dollars, not including the certificate of membership for which a small fee will be charged to meet the expense of lithographing, printing and mailing.

We anticipate a membership of at least five hundred before the next annual meeting which is set for May 16 at Springfield, Illinois.

This report is published in the hope that others may make a similar

start in other States. The writer will be glad to lend every assistance in his power.

Very respectfully,

GUSTAVUS M. BLECH,

Chairman, Committee on State Subordinate Associations.

31 North State Street,

Chicago. March 19, 1921.



COMMENT AND CRITICISM

ITEMS OF INTEREST TO OFFICERS OF THE RESERVE CORPS

These items are extracted in the office of the Surgeon General of the Army from records there.

CONTENTS

- I. Reorganization of the Officers' Reserve Corps as provided by the Act of June 4, 1920.
- II. Reserve Corps Notes:
 - (a) Revision of Army Regulations.
 - (b) The Caduceus.
 - (c) A Lapel Button for Members of Officers' Reserve Corps.
 - (d) The Medical Regiment.
 - (e) Development and Improvement of Medical Department Material.
 - (f) First-Aid Packet to be Modified.
 - (g) Development of an Airplane Ambulance.
 - (h) Present Status of Preventive Medicine in the Army.
 - (i) Bacteriologic Data on the Epidemiology of Respiratory Diseases in the Army.

REORGANIZATION OF THE OFFICERS' RESERVE CORPS AS PROVIDED BY THE ACT OF JUNE 4, 1920

A committee composed of Regular Army Officers and an equal number of Reserve, National Guard, and former officers has nearly finished the preparation of the new regulations which are expected to be ready for issue within a few weeks. These regulations when approved by the Secretary of War will govern the appointment, assignment, training, promotion, and discharge of the Reserve Corps of all branches of the establishment. The need of these regulations has been felt for a long time, as it is well known that many former officers are desirous of joining the Reserve Corps as soon as a definite plan of organization has been announced.

PRESENT STATUS OF THE RESERVE

As provided in the Act of June 4, 1920, there have been established within the Medical Department, Medical, Dental, Veterinary, Sanitary and Medical Administrative Sections. The personnel of the Sanitary, Section is composed of Psychologists, Sanitary Engineers, Food and Nutrition Experts, Chemists, Hospital Architects, Laboratory and X-Ray Technicians, Public Health Licentiates who are not graduates of medicine, Statisticians, and Business and Technical Men engaged in the production of supplies and appliances used by the Medical Department.

The Sanitary Corps ceased to exist on December 31, 1920, and there

was no counterpart of this corps in the organization of the Regular Army until recent date. A tentative arrangement was made during this period whereby officers of the Sanitary Corps who, upon discharge, signified their desire to join the Reserve Corps, were commissioned in the Quartermaster's Section, Officers' Reserve Corps, "for the Sanitary Corps." The transfer is now being effected. The Nursing Section of the Reserve Corps will probably be provided for in special instructions from the War Department, as the provisions governing the Officers' Reserve Corps and the Enlisted Reserve are not specifically applicable to nurses who are neither commissioned nor enlisted. At the present time the Red Cross Nurses represent the Reserve for the Army.

STRENGTH OF THE RESERVE CORPS

The following represents the strength of the various sections of the Medical Department Reserve on April 1, 1921:

	Brig. Gen.	Col.	Lieut. Col.	Major	Capt.	1st Lieuts.	2d Lieuts.	Total
Med. Reserve Corps....	3	98	404	1,851	2,362	944	.....	5,662
Dent. Reserve Corps....	.....	.....	16	102	495	3,133	.....	3,746
Vet. Reserve Corps....	.....	.....	.....	11	50	101	179	341

Reserve Corps Officers Reported on Active Duty

	Brig. Gen.	Col.	Lieut. Col.	Major	Capt.	1st Lieuts.	2d Lieuts.	Total
Med. Reserve Corps....	1	.....	.....	10	33	8	.....	52
Dent. Reserve Corps....	.....	.....	.....	4	8	17	.....	29
Vet. Reserve Corps....	.....	.....	.....	.....	2	8	3	13

Applications for appointment may be made by former officers direct to the Adjutant General or through the Surgeon General. Separate application is not necessary in case the officer signified on Form 150, at the time of discharge, his desire to join the Reserve Corps. Upon receipt by the Adjutant General of an application for appointment it is referred to the Surgeon General for recommendation as to eligibility, suitability, and grade. The entire record of the officer during the World War is reviewed by a board of officers in the Personnel Division of the Surgeon General's Office and a recommendation made to the War Department.

The inequalities of grade now held by Reserve Officers are largely

the result of legal restriction. Immediately after the Armistice the appointment of former officers in the Reserve Corps was governed by laws passed during the emergency and provided for the appointment of officers in any grade. The Appropriation Act of July 11, 1919, limited the appointment to the same grade or one higher than that previously held. The Act of June 4, 1920, under which appointments are now being made, again changed the law governing appointment in the Reserve, irrespective of department, and limited the appointment to the same grade or a lower grade than that held in service during the World War.

CLASSIFICATION

At the beginning of the World War there were only several hundred officers in the Medical Reserve Corps, which was expanded in a year and a half to about thirty thousand. Naturally it was impracticable in the stress of war to accurately classify and appropriately assign this number of medical men. The experience of this war has clearly demonstrated the necessity of prewar organization, the keynote of which is accurate classification. Under the direction of the Surgeon General the record of every officer now in the Reserve Corps is reviewed, and each officer has been requested to fill out and forward to the office a questionnaire detailing not only a statement of service during the War, but other data as to his qualifications and preference for service. A general outline of the classification adopted for this purpose, and based largely upon actual service during the War, follows:

Field Surgeons.—

Division Surgeon
Sanitary Inspector
Medical Regiment (sanitary train)
Ambulance Company
Hospital Company
Regimental
Field Surgeon of other units.

Specialists.—

Chemical Warfare
Eye, Ear, Nose, and Throat
Air Service
General Practice
Internist
Cardio-Vascular
Diagnosis
Serum-Therapy
Tropical Medicine
Tuberculosis (Pulmonary Diseases)
Laboratory—Epidemiologist
Neuro-Psychiatry
Orthopedics

Surgery

Abdominal
Anaesthesia
Assistant
Cranial and Neural
Eye
Ear, Nose and Throat
General and Prosthetic
G. U.
Orthopedic
Roentgenology
Reconstructive (Physio-Therapy)

Administration.—

Commanding Officer of Hospital
General
Station
Evacuation
Surgical
Executive Officer
Adjutant
Registrar Officer
Supply Officer

It is estimated that the Medical Reserve Corps should consist of at least 25,000 officers with a proportionate number of Dental, Veterinary, Sanitary, and Medical Administrative Corps Officers.

After a study of their qualifications, preference, and territorial location, tentative assignments to either combat or medical units are to be made. If the war plans call for the organization of territorial divisions and corps, each medical officer will be assigned to either combat troops or medical units, such as Medical Regiment (old Sanitary Train), Evacuation, Surgical, General or Special Hospital, Surgical team, Splint team, special duty with the Chemical Warfare Service or Air Service or Laboratory Service, or as professional consultant, or to duties in connection with the mobilization and organization of an Expeditionary Force. It is quite probable that a decentralization of the details of organization will be made, placing much of the responsibility on the Corps Area Commanders, in order to facilitate organization, training, and rapid mobilization. It is understood, however, that all enrolments in the Reserve Corps will be effected through the War Department.

RESPONSIBILITY OF RESERVE OFFICERS

There seems to be considerable misunderstanding as to the responsibility of Reserve Officers regarding active service. It should be clearly understood that under the law of June 4, 1920, Reserve Officers cannot be called to active duty in time of peace without their consent for more than 15 days in each calendar year. It has never been the policy of the War Department in time of peace to call Reserve Officers to active duty except voluntarily. The training plans have not matured. Practical training for Reserve Officers will depend quite largely upon public sentiment as expressed in Congressional appropriations. The War Department has announced that there will be no training before the end of the next fiscal year, June 30, 1922, except for volunteers. The Surgeon General, however, hopes that for those who can spare the time the educational facilities of the Medical Field Service School at Carlisle, Pa., may be made available for a limited number of Reserve Officers during the summer of 1921, so that they can be trained in the special lines of duty to which they may expect assignment in time of war.

RECRUITMENT OF THE RESERVE CORPS

After the organization of the Reserve Corps has been effected and definite regulations have been established and former officers who desire reappointment have been enrolled, the normal method of recruiting will be through the Reserve Officers' Training Corps graduates from the units that have been and are to be established in the medical schools

of the country. The forthcoming regulations will no doubt permit the enrolment of civilians without previous service. A study of the sentiment among medical men and an analysis of the letters of criticism received by the Surgeon General justify the expectation that as soon as definite regulations governing appointment, assignment, training, and promotion of the Officers' Reserve Corps have been published there will be a great increase in the number of former officers enrolled in the Reserve Corps.

NATIONAL GUARD MEDICAL OFFICERS AND RESERVE OFFICERS OF THE
PUBLIC HEALTH SERVICE ELIGIBLE FOR APPOINTMENT AS
RESERVE CORPS OFFICERS

The Act of June 4, 1920, specifically provides that "any Reserve Officer may hold a commission in the National Guard without thereby vacating his Reserve Commission." The War Department has recently ruled that Reserve Officers of the Public Health Service may also be commissioned in the Reserve Corps of the Army. This was a decision earnestly requested by the Surgeon General in view of the fact that the Public Health Service in time of peace is carrying on work analogous to that of the Medical Department of the Army, and the training therein received by Officers would be an advantage to the Army. Many of the Officers of the Public Health Service Reserve are very desirous of holding membership in the Reserve Corps of the Army and availing themselves of such training facilities as may be authorized. It is clearly established by law that in time of war the allegiance of such an officer is to the Army, without further Executive order, which, however, may cause assignments to be made as required.

REVISION OF ARMY REGULATIONS

The revision of all administrative regulations has been directed by the War Department and is now in process.

The present Army Regulations and Administrative Manuals for the various staff corps of the Army will be combined in the new form of regulations. Therefore, the Manual for the Medical Department, as such, will cease to exist when the new Army Regulations are issued. These regulations will be issued in pamphlet form patterned after the form of Special Regulations as now published. There will be a separate pamphlet for each particular subject as, for instance, Appointment in the Regular Medical Corps, U. S. Army; Reappointment to the Active List of Former Officers of the Regular Army and Retired Officers; Inspector General's Department—General Provisions; Corps of Engineers, Maps and Mapping, etc. The pamphlets will bear distinctive numbers, and each pamphlet will be divided into sections bearing on

particular points of the subject, with an index at the head of the pamphlet. These regulations will contain citations, legal authorities, statutory, and other, which support or have a reasonably direct bearing upon such of the several provisions thereof as are sustained by specific authority. The entire series will be in document form, octavo size, and bound in loose leaf.

THE CADUCEUS

The Caduceus has been in use in the Medical Department of the United States Army since 1856, when it appeared on the chevrons of hospital stewards.

It was adopted as the official insignia of the Medical Department in 1902.

A Caduceus strikingly similar to ours appears at the entrance to the port of Marseilles, France. It was placed there as an emblem of neutrality, adopted probably from the Phoenicians who used it generally in commerce for this purpose.

The English and Germans prefer the knotted staff entwined with a single serpent, which is the emblem of Aesculapius. In the *Bulletin, Medical Library Association*, Lieut. Colonel F. H. Garrison gives the following account of the origin and use of the Caduceus as a symbol of the medical fraternity:

"The caduceus, an Assyro-Babylonian symbol of some 5500 years ago, representing a god, some of whose functions were medical, became, as the wand of the Greek Hermes, a good practical working symbol of neutrality and peaceful negotiations. It is therefore an appropriate symbol for medical officers on active duty in war or peace. The Aesculapian staff, with the single entwined serpent, which forms part of the coat-of-arms of the Medical Corps of the U. S. Army, is an appropriate symbol of its medical, as distinguished from its administrative and military, functions. In all human probability, therefore, the caduceus will continue to be employed by the Medical Corps of the U. S. Army, when on active duty in war, in token of its non-combatant functions and of its neutral status on the battlefield under the Geneva Convention or international Red Cross agreement of August 22, 1864."

A LAPEL BUTTON FOR MEMBERS OF OFFICERS RESERVE CORPS

For the information of members of the Officers' Reserve Corps we quote below the official authority and specifications for the Lapel Button for members of the Officers' Reserve Corps:

Circular No. 27, War Department, dated January 17, 1920, reads:

"A lapel button for members of the Officers' Reserve Corps has been approved. This button is for optional wear on civilian clothes only."

The specifications are as follows:

"A circular button of gold or gilt, one-half inch in diameter, with face enameled in the color of the facings of the arm or corps, surrounded by a narrow circle of gold or gilt, and with the letters 'U.S.R.' in the center. These letters to be in gold or gilt when there is but one color in the facings; when there are two colors, the letters will be in the color or the piping or second color. The design of these buttons will conform to the drawing in the office of the Quartermaster General, Director of Purchase and Storage."

The button is to be issued by the Quartermaster Department.

THE MEDICAL REGIMENT

The Tables of Organization recommended by the Surgeon General for the new medical regiment, which is to replace the old sanitary train, are being published by the Adjutant General of the Army.

The aggregate strength of the medical regiment for war is 68 commissioned officers and 860 enlisted men, and for peace 25 commissioned officers and 277 enlisted men.

The medical regiment at peace strength is commanded by a colonel (who also discharges the functions of division surgeon), and consists of: a regimental headquarters, 1 sanitary company, 1 ambulance company a.d., 1 ambulance company, motor, 1 hospital company, motor, 1 medical supply section, 1 medical laboratory section, and 1 veterinary company.

The medical regiment at war strength is commanded by a colonel (who also discharges the functions of division surgeon), and consists of: a regimental headquarters, 1 service company (a company hqrs., 1 staff section, and 1 supply section), 1 sanitary battalion (hqrs. and 3 sanitary companies), 1 ambulance battalion (hqrs. and 1 ambulance company a.d., and 2 ambulance companies, motor), 1 hospital battalion (hqrs. and 3 hospital companies, motor), 1 medical supply section, 1 medical laboratory section, and 1 veterinary company.

Under the new reorganization the ambulance company becomes strictly an evacuation (transportation) unit. The personnel and functions hitherto allotted to the "dressing station and litter bearer section" of the old ambulance company will be absorbed in the new sanitary company.

All ambulance companies at war strength are now provided with 20 ambulances, instead of the previous allowance of 12. Those at peace strength are provided with 10 ambulances.

Equipment tables will now be prepared for these new units. As so

many items are under consideration with a view to revision of type the first tables to be issued will closely approximate the old tables, references being made in them to all items of special equipment which are being developed in our experimental laboratory at Carlisle for adoption in lieu of the old types.

Owing to the fact that the present legal allowance of enlisted men for the Medical Department is inadequate it is doubtful that any of the Medical Regiments can be filled to the strengths prescribed in Tables of Organization. Under the circumstances, in the distribution of Medical Department personnel hospitalization requirements necessarily must be given priority.

“GENERAL ORDERS, NO. 5, JANUARY 22, 1921

Designation of Units of the Mobile Forces of the Army of the United States.—Section I, General Orders, No. 115, War Department, 1917, as amended by section VIII, General Orders, No. 134; section XIV, General Orders, No. 139; section XI, General Orders, No. 144; and section I, General Orders, No. 155, War Department, 1917; and by section VII, General Orders, No. 8; section II, General Orders, No. 20; and section III, General Orders, No. 35, War Department, 1918, is rescinded and the following substituted therefor:

1. Section 1, National Defense Act, as amended by the act of Congress approved June 4, 1920, designates three components of the Army of the United States as follows: Regular Army, National Guard, Organized Reserves.

2. Section 3a of the above-mentioned act prescribes that—

“In the reorganization of the National Guard and in the initial organization of the Organized Reserves the names, numbers, and other designations, flags, and records of the divisions and subordinate units thereof that served in the World War between April 6, 1917, and November 11, 1918, shall be preserved as such as far as practicable.”

And that—

“Subject to general regulations, approved by the Secretary of War, the location and designation of units of the National Guard and of the Organized Reserves entirely comprised within the limits of any State or Territory shall be determined by a board, a majority of whom shall be reserve officers, including reserve officers who hold or have held commissions in the National Guard and recommended for this duty by the governor of the State or Territory concerned.”

3. It is desired also to preserve as such in the Regular Army, as far as practicable, the names, numbers, and other designations of the units thereof that served in the World War.

4. With such exceptions as may be required by the foregoing provisions, the following system of numbering and designating units of the mobile forces of the Army of the United States will be used:

Units	First number of series			
	Regular Army	National Guard	Organized Reserves	
Medical:				
Medical regiments. . . .	1	101	301	1st Medical Regiment
Sanitary companies. . . .	1	101	301	Sanitary Co. No. 1.
Ambulance companies. . .	1	101	301	Ambulance Co. No. 1.
Hospital companies. . . .	1	101	301	Hospital Co. No. 1.
Medical Supply Sections	1	101	301	Medical Sup. Sec. No. 1
Medical laboratory sections.	1	101	301	Medical Laboratory Section No. 1.
Veterinary companies. . .	1	101	301	Veterinary Co. No. 1.
Evacuation Hospitals. . .	Single series beginning with 1.			Evacuation Hospital No. 1.
Surgical hospitals.	Single series beginning with 1.			Surgical Hosp. No. 1.
Convalescent hospitals. .	Single series beginning with 1.			Convalescent Hospital No. 1.
Army medical laboratories.	Single series beginning with 1.			Army Medical Laboratory No. 1.
Medical Supply Depots. . .	Single series beginning with 1.			Medical Supply Depot No. 1.
Veterinary evacuation hospitals.	Single series beginning with 1.			Veterinary Evacuation Hospital No. 1.

DEVELOPMENT AND IMPROVEMENT OF MEDICAL DEPARTMENT MATERIEL

An agency for experimental work connected with the development of technical equipment and supply has long been a need of the Medical Department. This has been most forcibly brought home during the recent emergency. Although from time to time such agencies have appeared in scattered form, an organized group under single control and conceived along broad lines has not heretofore existed. In December of the last year the Surgeon General decided that such an establishment would be developed and that the unit would be designated, *The Medical Department Equipment Laboratory*.

It was not considered feasible to set up this plant as a separate entity and it therefore became necessary to decide upon the organization with which it was to be linked. It seemed naturally to fit into the educational system in connection with training for field service, but at that time a tactical school for the Medical Department was nonexistent, so much of

such subjects as was possible being covered by the courses at the Army Medical School. Much effort had been expended in trying to obtain authority and a site for such a school, but these were uniformly unsuccessful until May, 1920, when the War Department authorized the establishment of the school on the old military post of Carlisle Barracks at Carlisle, Pennsylvania.

On July 1, 1920, the Medical Department Field Service School was inaugurated at Carlisle. At once this became the place *par excellence* for the institution of the Equipment Laboratory. Consideration had previously been given to the placing of this organization in or about Washington where it might enjoy some of the advantages of the remarkable facilities at the Bureau of Standards, but all things considered, including the difficulties inherent to the acquisition of the site, such a location did not offer sufficient advantages to outweigh those tremendous ones to which it would fall heir by coming under the control of the Commandant of the school at Carlisle.

The Indian School, maintained for many years at this place, had been of a technical and industrial nature and, as a corollary to this vocational function, a considerable amount of mechanical resources in personnel and materiel had accumulated. When the reservation and its adjuncts were transferred during the War from the Interior Department to the War Department for hospital purposes a great part of these facilities were included in the transfer. In the first inspection made of the site by representatives of the Surgeon General's Office the splendid possibilities of this station as a future site for the Equipment Laboratory was apparent. It resulted, therefore, that specific recommendation was made that the laboratory be established as an integral part of the new school.

This recommendation received favorable consideration by the Surgeon General and on September 18, 1920, the Commandant of the school was directed to organize the laboratory as a branch of the school function in parallel with other divisions of the teaching staff, the Director of the Laboratory becoming a member of the faculty. Subjects connected with the medical supply service therefore will be taught by personnel working on the development of the equipment. It is now the intent to push forward practical experimentation with all present and projected types of equipment for use with the Medical Service during peace and war.

The plan of equipment development considers final acceptance of new or modified items by the Surgeon General's Office and to the Coordination, Organization, and Equipment Division thereof this work has been delegated in particular. In general, all such functions are super-

vised and coordinated by the Operations Division of the War Department General Staff. Ideas and suggestions received from various sources are studied by the C. O. E. Division, and ordinarily transmitted to the school at Carlisle for further study, application, or experimentation, as conditions appear to demand.

THE FIRST-AID PACKET TO BE MODIFIED

The first-aid packet adopted for use in the Army has fulfilled a most useful purpose during peace and war. As now constituted the essential material consists of two packages of sterile gauze with bandages and safety pins attached. The packages are paper wrapped and the whole included within a hermetically sealed metal container. A metal strip sealing the container has attached a ring in which the finger is looped when the tin is opened. The first-aid packet when enclosed in its canvas pouch and suspended from the belt is a part of the individual equipment of all officers and enlisted men prepared for field service. This packet, however, has always had the important mission in peace of supplying quickly a temporary sterile dressing for the many small emergencies that occur in the everyday life of troops in garrison.

During the recent emergency, great numbers of these packets and pouches were produced and issued to the Army for use in both the Zone of Interior and the Theater of Operations. As a result of this wide usage a considerable number of weaknesses were found in the packet and its contents, and efforts are now being directed toward the improvement of this unit of equipment.

The metal container has been found to be satisfactory, but if a waterproof cement can be made applicable to a composition fiber container such fiber will be considered in the development. The amount of strength required to open the packet is a real consideration to the wounded soldier on the battlefield, and it would be an advantage if the present method of opening could be made less difficult. The container has heretofore fitted too closely in its pouch and many packets are ruined by the ripping of the cover when the packet is being withdrawn with the finger ring. This difficulty is partly obviated when the packet is placed ring down in the pouch, but the tight fit of the pouch, which is increased when the material is wet, still remains.

The pouch, therefore, is not without its faults, and it is the intent to remedy these. The material of which it is constructed is too light, and hereafter it will be made of woven fabric fitted with more up-to-date clasps. Attached to the belt the first-aid packet and pouch have been carried in such a way that the long dimension has been horizontal to the long axis of the belt. This method consumes unnecessary space,

and an improvement will be that of suspending this equipment perpendicularly, as is done with the cartridge clip container.

The contents of the packet have not been found altogether satisfactory, for the reason that it contains too little sterile material for any but very small wounds. During the World War there were issued individual dressing packets of several sizes in addition to the first-aid packet. It is hoped that by increasing the amount of material contained in the latter and compromising on one of the former we may determine upon two individual dressing units. The smaller of these will be the first-aid packet when enclosed in metal and a small individual dressing when linen wrapped as heretofore. The larger of the new forms will be more generous in its contents as to quantity and variety.



It is possible that such a consideration will force an increase in the size of the metal container and pouch, but an effort will be made to preclude this by compressing the contents into the tin. There is naturally a limit to such possibilities, however, since overcompression results in a fiber rupture and is to be condemned.

The development of this unit of individual equipment is a pressing need at the present time since all arms and services are pushing forward in all haste on the improvement and modification of their respective equipments for officers and enlisted men.

THE DEVELOPMENT OF AN AIRPLANE AMBULANCE

Many previous models of airplane ambulances were in use at the flying fields in this country during the war, and rendered valuable service on many occasions, proving both actually and potentially the value of such a service. These old models were all simple modifications of the Curtis training planes, but in the new ambulance, for the first time, a fuselage designed primarily for the transportation of the sick or wounded is used, providing space for two litter patients, a medical attendant, and a pilot.

The basis for this new ambulance is the DH-4 type of airplane, but many modifications have been made to increase its safety and stability. Thus the landing gear has been moved forward about twelve inches and the dihedral angle increased to 2.75° . The wings have a 12-inch stagger, and the angle of incidence is 3° .

Necessary accommodations for the wounded are provided by increasing the depth of the fuselage behind the pilot's seat, and dividing the space thus provided into an upper and lower compartment by means of a longitudinal partition. These compartments are reached through doors running their entire length and opening on the side of the fuselage. Each compartment is furnished with  Stokes  litter,

which can be securely fastened in its compartment and is easily handled by two men. Adequate light and ventilation are provided by means of windows in each compartment. Above the upper compartment is a cockpit provided with a portable seat, which can be used by a medical officer going to the aid of the injured.

The entire plane is finished in white paint with the Air Service insignia on the wings, the Red Cross on the sides of the fuselage and landing wheels, and the Medical Corps caduceus on the rudder.

The performance of this ship on its trial flights has been most creditable. After the usual preliminary flights at McCook Field, it was flown to Washington and from there to Langley Field and return, the flight from Washington to Langley Field being made in 65 minutes and the return in 105 minutes, the distance each way being approximately 130 miles.

Several ambulances of this type are now being constructed for use on the Mexican Border, and what they will mean for our soldiers on the Mexican Border can best be appreciated by those who have seen duty at the hospitals in that section. No longer will the luckless recruit who has been bested in a contest with the famous Western broncho miles from a hospital be jolted for hours in a rough-riding automobile over cactus and mesquite, but borne on silvery wings, cushioned by a mile of air, will be conveyed in the twinkling of an eye to the rest and comfort of a modern hospital.

THE PRESENT STATUS OF PREVENTIVE MEDICINE IN THE ARMY

Tremendous strides have been made in the control of diseases of both the intestinal and insect-borne groups. This is also true with regard to some of the miscellaneous diseases, such as smallpox. Some progress has been made in controlling the venereal diseases. On the other hand we have made no appreciable advance as yet in the control of the Respiratory Diseases. These facts are brought out in the following extract from the report on "Activities of the Office of the Surgeon General of the Army during the War":

"The following figures indicate the enormous reduction in deaths which has resulted from the sanitary measures enforced during the present war as compared with the practice in vogue in the Civil War, the Franco-Prussian War, the Spanish War, and the Boer War. The figures indicate the actual deaths which occurred during the period September 1, 1917, and May 2, 1919, in our Army, both in the United States and in France, which has an average strength of 2,121,396, and the number of deaths which would have occurred in an army of the

same size for the same period if the mean annual death rates for the Civil War and for the Spanish War respectively had prevailed during the present war. The figures for the present war are based upon current telegraphic reports, and while approximately accurate may be subject to slight revision on completion of final statistics.

	Number of deaths that occurred in present war, Sept. 1, 1917–May 2, 1919. Average strength approximately 2,121,396	Number of deaths that would have occurred if the Civil War death rate had obtained.	Number of deaths that would have occurred if the Spanish-American War death rate had obtained.
Typhoid fever...	213	51,133	68,164
Malaria.....	13	13,951 ³	11,317
Dysentery.....	42	63,898 ²	6,382 ²
Smallpox.....	5	9,536	37
Pneumonia.....	41,747 ¹	38,962 ¹	6,086 ¹
Scarlet fever....	167	112	222
Diphtheria.....	100	1,188	149
Tuberculosis....	1,220	9,574	631
Meningitis.....	2,137	3,859	4,081
Other diseases...	3,768	34,881	15,587
Total for disease	49,412	227,094	112,656

¹ Includes deaths listed from measles, influenza, empyema, inflammation of the lungs, and pleurisy, as well as pneumonia.

² Includes dysentery and diarrhoea.

³ Includes malaria and remittent and congestive fevers.

"In the Franco-Prussian War the Germans lost 9,000 men from typhoid fever. With reference to the typhoid in the Boer War, Col. F. F. Russell quotes from Leishman, "Antityphoid Vaccination," *Glasgow Medical Journal*, 1912, LXXVII, 406:

"We know in general that there were 57,684 cases of typhoid and 8,022 deaths among 380,605 men."

"The low death rate from tuberculosis in the Spanish War is due to three causes: first, that the war was of short duration; second, that the war period was in the summer; third, and most important, that all cases of tuberculosis were discharged from the service almost as soon as diagnosed and so the deaths when they occurred were credited not to the army but to the civil community. In our present war nearly all tuberculous soldiers are held in the army for indefinite sanitarium treatment when there is any indication that such treatment will be beneficial, and of course a certain percentage will die in the service while the majority are being apparently arrested.

"The number of deaths from pneumonia is slightly greater than for the Civil War comparison and much greater than for the Spanish War

comparison. The Spanish War rates were low because the war period was entirely in warm weather when pneumonia is infrequent. The greatest cause of the high pneumonia rate for the present war was the pandemic of influenza, a factor which occurs only about once in thirty years. Had this epidemic not occurred the rate would have been much lower than for the Civil War, and probably lower than for the Spanish War. Taken all in all, however, it must be confessed that the secret of the control of respiratory diseases, particularly pneumonia, still remains undiscovered."

BACTERIOLOGIC DATA ON THE EPIDEMIOLOGY OF RESPIRATORY DISEASES IN THE ARMY

(Abstract of an article by Major Henry J. Nichols, M. C., published in the *Journal of Laboratory and Clinical Medicine*, Vol. V, No. 8, May, 1920.)

Although many investigators have tried to determine the exact route taken by the specific microorganisms of respiratory diseases in passing from one person to another, opinion on this subject is still divided into two more or less opposing hypotheses. According to one, the microorganisms are chiefly air-borne and are inhaled, either at some distance from their source, or usually at short range in the droplets of coughs and sneezes. According to the other theory, the air is practically free of pathogenic microorganisms which settle out quickly or die by drying. The organisms are believed to travel in infected discharges on some intermediate object such as the hands, cups, etc., and then back to the mouth. For brevity, one may be called the direct and the other the indirect method.

Most of the results of the field work recorded in this paper have been extracted from Major Teague's noteworthy report. The writer is responsible for the general discussion, the work on the antiseptic action of soap, and for the conclusions.

The work was carried out on troops of Sanitary Trains at Camp Meade. The throats and tonsils of 318 men were cultured for hemolytic streptococci, and 159, or 50 per cent, were found positive in varying degrees. An effort was then made to trace these organisms in carrier's hands and in their environment.

EXAMINATION OF FINGERS

As a control, nine men with positive throat cultures rubbed the index finger back and forth on their lips and then streaked it on a part of a blood agar plate which was more fully spread with a platinum loop. Six of these plates showed colonies ranging from ten to many.

The fingers of carriers were examined in the middle of the morning:

(1) by rubbing the index finger of the right hand over part of an agar plate and then spreading by a loop; (2) by washing the fingers in a small amount of salt solution and plating a few drops on agar plates. Out of 159 carriers examined in this way, 27, or 16.9 per cent, were positive. More than half of these positive plates showed only a single colony, and only five showed more than five colonies.

EXAMINATION OF DISH WATER

The next step was to examine the dish water. Dish water was collected from 24 messes after the dinner dishes had been washed. The number of men in these messes ran from 30 to 300. The temperature was not sufficient to kill streptococci—averaging about 38°. One large drop was spread on a blood agar plate. None of these specimens showed any hemolytic streptococci. In eight messes lukewarm water without soap was used by request, and in one of these one colony of streptococci was found, and in another two colonies. Scrapings from dish mop handles showed no streptococci.

Although the fingers can be intentionally contaminated with streptococci by saliva, and although the organisms live on the fingers for hours, under ordinary circumstances few streptococci were found on the fingers, and none in the dish water, except when no soap was used.

As the hand is more generally recognized as a method of spread of causes of intestinal diseases, comparative observations were made, using the colon bacillus group as an indicator of fecal contamination. Out of 143 men examined for hand contamination, 42, or 29.4 per cent, were found positive.

The contamination of dish water was then looked into. In this work no streptococci were found in an amount which gave 4 out of 11 tests positive for colon bacillus.

Colon bacilli were found on the fingers and in dish water under conditions which showed no streptococci. The inference is that these two groups of organisms and the diseases for which they stand are spread in different ways.

Ordinary brown soap, largely sodium resonate, such as is used in dish water in army messes, reduced the number of streptococci from innumerable to 15 in two minutes. Hence, if any streptococci did get from the hands into the dish water they would have small chance to spread further, provided the dish water was soapy. On the other hand, none of the soaps tested killed the typhoid bacillus in 10 minutes. At low temperature, therefore, there is no barrier to the spread of intestinal organisms. The streptococci were killed whether the temperature was 38° or room temperature.

The point was raised by a sanitary inspector whether in a dirty dish water full of grease the antiseptic action might not be lost. To test this idea some boiled mutton fat was added to the soap, but no change occurred, either in reaction or in antiseptic effect. However, it was found that if the reaction of these soaps was changed from about 8.5 to 7 by the addition of HCl, their antiseptic action was lost. This result is apparently due to precipitation of the soap from solution. Free alkali apparently plays no part in the antiseptic action, as a NaOH solution of Ph9.6 has no antiseptic effect. But an alkaline solution is necessary, and the reading of the reaction of dish waters might be a valuable index of their suitability, as there is apparently enough acid in some dirty dishes to change the reaction and destroy the antiseptic effect.

As bearing on the problem in hand, it will be seen that the streptococcus is quickly destroyed in the average soapy dish water at ordinary temperature, and it does not seem possible that the few that reach the dish water can survive to pass on to another person. The practical point emerges however that the reaction of the dish water should be kept at about a Ph of 8 or over, and that an acid dish water has no antiseptic effect. On the other hand, the ordinary dish washing in the army seems to offer no barrier to the spread of intestinal organisms, and a hot or boiling water is necessary to prevent the possible spread of these organisms.

DISCUSSION

The interpretation which the writer puts on these data is that streptococcus carriers are not produced by contaminating their mouths with supposedly streptococcus laden dish water, but probably by inhalation. The evidence given above certainly favors this conclusion, and if streptococci can be taken as indicators of respiratory organisms in general the same conclusion holds good for them.

These data are subject to several limitations. The number of streptococci in carriers may be much less than the number of organisms in the watery discharges of the early stages of respiratory diseases. However, the results would still hold good for streptococcus carriers. Again, in the comparison of streptococci and colon bacilli it is to be remembered that only 50 per cent of the men carried streptococci, some in small numbers, while 100 per cent of persons carry large number of colon bacilli. On the other hand, the chances of hand contamination with streptococci are more frequent than with colon bacilli.

More observations can be made to advantage along the same lines and more attention could be paid to the possibility of the presence of agricultural colon bacilli and of streptococci from the stools or air, but

it is not believed that more detailed work will materially alter the results.

In regard to the actual program proposed of using boiling wash and rinse water, while it is not believed that this measure will reduce the incidence of respiratory diseases, this work shows the desirability of this measure as a preventive of the spread of intestinal diseases. The necessity for the presence of a sufficient amount of good soap is also emphasized.

If the specific causes of respiratory diseases are spread principally by inhalation, more constant attention must be paid to sanitation (ventilation) and personal hygiene, and the route of spread can frequently be broken. However, in the army there is a point beyond which such measures cannot go. There are times when soldiers must train and fight in common, in spite of the presence of pathogenic organisms in the air. A certain amount of sickness and death from this source is to be counted on, unless the troops have some immunity from previous exposure or unless they can be immunized with specific vaccines.

SUMMARY

1. Hemolytic streptococci were used as test organisms in collecting data on the possible routes of spread of the specific causes of respiratory diseases.

2. No evidence was found to support the theory that these organisms spread through dish water.

(a) Fingers of only 17 per cent of carriers showed streptococci, and only in small numbers.

(b) Dish water showed no streptococci except when no soap was used.

(c) Infection of the mouth did not occur when streptococci were smeared on the lips.

(d) Soapy dish water is antiseptic for streptococci if of proper reaction and made with proper soap.

3. Evidence was found that intestinal organisms can spread through dish water.

(a) Colon bacilli were found on hands of nearly one-third of troops.

(b) They were found in dish water down to 1/100 of a c.c. in some cases.

(c) Soapy dish water has no antiseptic action on colon bacilli.

4. Evidence was also found to support the inhalation theory.

(a) Droplets with streptococci remain suspended for several hours.

(b) The air of streptococcus wards contains streptococci for several hours after men have retired.

5. The use of boiling dish and rinse water is indicated not to prevent spread of respiratory diseases, but to prevent spread of intestinal diseases.

BOOK REVIEWS

ANESTHETICS. *Their Uses and Administration*, By Dudley Wilmot Buxton, M.D., B.S., Member of the Royal College of Physicians; Sometime President of the Society of Anesthetists; Member of University College; Consulting Anesthetist to University College Hospital and to the National Hospital for Paralysis and Epilepsy, Queen Square, and to the Royal Dental Hospital of London; Late Anesthetist to King George Hospital, and Administrator of Anesthetics and Lecturer in University College Hospital. Sixth Edition. Philadelphia: P. Blakiston's Son & Co., 1020 Walnut St., 1920. Price, \$6.00.

In the new edition the whole of the book has been revised and some sections have been rewritten. The modification and enlargement of our knowledge of anesthetics brought about by the Great War has made it necessary to recast portions of the book, and to add a section on shock in so far as that condition comes within the purview of the anesthetist. A new section on hemorrhage has also been added. This includes references to many forms of danger through severe hemorrhage. Doctor Crile's views have been discussed at some length, and the anoci-association plan has been adopted either in principle or in full detail. The chapter concerned with local analgesia and spinal anesthesia has been considerably enlarged and the portion on dental analgesia goes with some detail into the subject. As in the former editions, the volume is well illustrated and the typographical work is acceptable.

FRANCIS M. MUNSON.

NITROUS OXIDE-OXYGEN ANALGESIA AND ANESTHESIA IN NORMAL LABOR AND OPERATIVE OBSTETRICS. F. H. McMecham, M.D., Editor. A monograph prepared for the benefit of all those concerned in safer and more efficient obstetrics and anesthesia. The National Anesthesia Research Society. Columbus, Ohio, 1920. Price, \$2.50.

This monograph is the result of the labors of a publication committee practically all of whom are men of national reputation in their special line. The scientific literature of the subject has been thoroughly covered and every detail has been carefully worked with a view to giving the profession what it wants and needs in the most readily acceptable type and in the most definite form. The volume is most attractive in appearance, and is a fine example of the printers' craftsmanship.

FRANCIS M. MUNSON.

A SYNOPSIS OF SURGERY, by Ernest Hey Groves, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.). Fifth edition, illustrated. New York: William Wood and Company, 1921. Price, \$4.50.

The author in his first preface states that the volume is "an attempt to make an epitome of the salient facts in surgical practice, and to place these facts in such a manner that they may most easily and rapidly be referred to or revised." The present book has been brought up to date in every way. Additions have been made to various chapters, particularly to that dealing with fractures, as the author has found it "necessary to summarize the chief results of the war surgery." This is the most complete work of the kind that the writer is familiar with and it would be difficult to name a surgical subject discussed in a surgical treatise of many volumes that is not intelligently epitomized in these pages. It is an excellent book for the purpose intended; a rapid reference for medical students and practitioners seeking brief but accurate knowledge as to etiology, anatomy, signs and symptoms, prognosis,

diagnosis, and treatment of surgical affections. The knowledge is accurate and the book is exceptionally well written. There are thirteen colored anatomical plate drawings of surface markings; viz., The Head and Neck, Face and Neck, Thorax, Viscera, etc., Heart and Great Vessels, Abdomen from in front and behind, Deep Abdominal Viscera and Vessels from in front, The Upper Extremities, Hand from front, Gluteal Region, Vessels and Nerves of Thigh, Vessels and Nerves of Leg, Foot from Inner Aspect, Foot from Outer Aspect. These plates and the text which describes them are valuable and are to be commended. For the type of book it is the best with which the writer is acquainted.

JOHN E. SUMMERS, M.D.

1919 COLLECTED PAPERS OF THE MAYO CLINIC, Rochester, Minn. Octavo of 1,331 pages, 490 illustrations. Philadelphia and London: W. B. Saunders Company. Cloth, \$12.00 net.

This number of the Mayo Clinics has fifty-four contributors. They have written upon sub-divisions of the subjects: The Alimentary Canal, The Urogenital Organs, Nerves, Technic, and a number of general subjects, including addresses. The articles are of the same type as in late preceding numbers. The most valuable are those in which end-results of certain operative procedures are tabulated. For instance, "The Life Expectancy of Patients following Operations for Gastric and Duodenal Ulcer". "Surgical Renal Tuberculosis: The Prognosis"; "The Results of Operations for the Removal of Stones from the Ureter"; "Squamous-cell Epithelioma of the Lip; A Study of Five Hundred Thirty-Seven Cases." The vast material which has gone through the Mayo Clinic and the follow-up system adopted makes a study of their end-results more valuable than that of most other clinics. The place is well known; the system, those at the head and their subordinates, the reliability of records, all tend to place absolute confidence in the publications of the Clinic, and they are mile-posts for those of us traveling along the same road. In this number there are several short articles upon technique that are valuable. Other papers, one by Braasch on "Conditions Contra-indicating Operation, with Stone in the Kidney and Ureter"; another by Willius, "Auricular Fibrillation and Life Expectancy" based upon a study of five hundred cases of auricular fibrillation in which electro-cardiographic examinations were made at the Mayo Clinic, ought to be of great value to physicians in considering the wisdom of recommending for operation patients suffering with this complicating type of heart disease. Rosenow's studies in Influenza and Pneumonia are included in this volume, also Study X upon Poliomyelitis. Space does not admit of an extended mention of this splendid volume; it suffices to say that in the opinion of the writer no physician or surgeon, whatever may be his special preferred line of work, can afford to be without the whole series of "Collected Papers" from this deservedly distinguished source of information.

JOHN E. SUMMERS, M.D.

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THE PART OF THE MEDICAL DEPARTMENT IN MAINTAINING MILITARY MORALE

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THE WELLCOME FIRST PRIZE ESSAY, 1920

INTRODUCTION

MILITARY morale may be defined as mental soundness, vigor, confidence, and determination in the mass. An army that has superior morale is convinced of the righteousness of its cause, has faith in itself, is strong in discipline, and is confident of its ability to defeat the enemy in battle. It has a certain mental or moral vigor which, based on physical vigor, carries it forward into the greatest dangers and is not destroyed by check or defeat. Superior morale enables both general and army to act boldly; to take the offensive, by which alone can enduring victory be won; to look less often to the rear; and to put full strength into the conflict. A small army with superior morale has frequently beaten a larger army with lower morale, even when opposing leaders and other factors were approximately equal. And, still more than on the battlefield, has morale tipped the scale of the fates in a long-drawn contest of endurance, where the last reserves of mental and moral strength were levied on to wear out a stubborn foe. Morale was probably the most important factor in making the army of one of the great Powers victor in every European conflict of the past two hundred years. That army, often poorly led, often confronted by equal or superior numbers, always has had a reserve of moral strength, and in the last ditch has displayed a dogged determination to die rather than yield, which, in spite of delays and blunders, has finally brought victory.

Morale is not a new idea. It was appreciated by Napoleon, by Cromwell, by Caesar, and by Alexander. Why else the pride and panoply of war, the thunder of the rolling drum, the inspiring calls at the last moment before charging the enemy home? All these were definite efforts to inspire morale. Alexander knew the value of morale when before the battle of the Issus he called his principal leaders about him

and inspired them with his own confidence. As Arrian relates, he reminded them that they were to meet a foe whom they had met before and vanquished; they were used to toil and danger—the enemy enervated by luxury and ease. He reminded them of their former brilliant achievements and recalled their deeds, mentioning them by name. He finished by reciting the glorious tale of Xenophon and his immortal ten thousand who, without horsemen, archers, or slingers, had put to flight the king and all his forces before the very walls of Babylon. And, last of all, he assured them that there was evidence that God was on their side. The enthusiasm of battle laid hold on them all; they thronged about Alexander and begged him to lead them on. His army was consolidated into one thought and aspiration, the thought and aspiration of its leader.

Nelson understood something of the value of morale when before his last fight he flew the signal which has been an inspiration to every seaman of his country from that day to this. It was not only a call to battle, but a call so worded as to appeal to the most powerful sentiments of his race.

Oliver Cromwell appears to have had a deeper insight into character and its part in morale than other great military leaders of the past. He considered not only the one grand effort of battle, but a studied and lasting morale, to be attained by careful selection of men, by training and discipline, and by proper living. In the often-quoted conversation with Hampden, he said: "Your troops are most of them decayed serving men and tapsters and such kind of fellows, and their troops [the king's] are gentlemen's sons and persons of quality. Do you think that the spirits of such base and mean fellows will ever be able to encounter men that have honor and courage and resolution in them?" Hampden thought Cromwell had a good notion but an impracticable one. "Nevertheless," said Oliver, "I have raised such men as had the fear of God before them, as made some conscience of what they did, and from that day forward they were never beaten; and it hath some instruction in it." Truly it had much instruction in it. Men of character and zeal were chosen when possible, and Cromwell said of his men of "the New Model" army: "Being well armed within by a good conscience and without by good iron arms, they would as one man stand firmly and charge desperately." That this was no idle boast every battle from Edgehill to Worcester abundantly proved.

These instances are not cited to demonstrate by what manner morale may be raised today; somewhat the reverse. Deplore it as we may, the age of faith, of high enthusiasm, of exalted devotion to king and country, has largely departed. The times are different and mental habits have changed along with changes in modes of living, customs, and

tastes. Were an American general of today to harangue his soldiers after the fashion of Napoleon, he would excite only ridicule and disgust. In very few places could religious zeal and fanaticism be stirred to the pitch of the Middle Ages. A Joan of Arc in an Anglo-Saxon nation today would be an absolute impossibility. The human race—at least the Anglo-Saxon portion of it—has advanced somewhat from the age of adolescence, emotional zeal, enthusiasm, and faith; it has reached the middle-age period of reason, matter-of-factness, and reliance on careful preparation and determination. The result of this advance is that factors which tend to increase morale have changed materially. They have also become more definite and tangible; therefore more readily marshaled and applied. In the old days the one approved and generally practiced method of raising morale was to appeal to the feelings, either on the side of religion, patriotism, family, or some such subject of general application. Soldiers in the mass were simple, child-like men; their passions could be stirred as can those of a mob. Their generals took advantage of this mental state by means of stirring speeches before combat. These appeals were of temporary benefit, for battle or other special occasions. Such stimulants to morale were then irregular and unscientific. They might assist in winning a battle; they did not, as a rule, prepare the army for a long struggle nor help maintain its morale through suffering and defeat. When an army did preserve its morale through years of unavailing struggle, as in the Low Countries or during the American Revolution, it was maintained by purely natural causes and not at all by artificial effort or studied means. Today the emotions are not the principal natural means of approach. Men must be reached by more reasonable and scientific methods.

But a difficulty appears. In approaching men through reason one country can make about the same appeal as another. In the recent great war it is probable that the average German was just as firmly convinced of the justice of his cause as was the average American or Englishman. Any country going to war can convince its people that they have the right of the contest; otherwise they would not go to war. This does not mean that soldiers are not to be convinced that they are fighting a righteous war. Quite the contrary; they must be convinced that they are. But that is not enough. The enemy will do the same thing. He will incite patriotism as well as you, and the result is check-mate. Something more, then, is necessary. What is it? What definite, reasonable, and available means are at hand? Not some supernatural means, never, of course, found; but something simple, plain, logical, ready to hand, and applicable on a wide scale among all troops.

A glance at the records of former armies will lead to the conclusion

that in addition to the appeal to the emotions there has been another nearly universal appeal. Armies, even zealous and enthusiastic armies, have frequently deteriorated in morale, lost heart, and been decisively and finally beaten, through the lack of such simple things as food, clothing, supplies, even pay. In fact, now that the days of faith have largely departed, there is no other so available means of raising and maintaining the morale of troops as the simple one of keeping them hearty and content, through a plentiful supply of rations, clothing, and pay. Health and recreation, too, must not be neglected. Given two armies of equal strength, leadership, discipline, and initial morale; but one of them sickly, poorly paid, inadequately supplied, the other in good health, well fed, clothed, and supplied; the latter will almost certainly win in battle. Under these circumstances the two armies somewhat resemble two football teams; if one of these teams is well trained, vigorous, and cheerful, it will beat the team that is poorly trained, less sturdy, and discontented. The soldiers of today may be fairly compared with the members of a League baseball club. To be plain, the average soldier—especially the "selected man"—does not go into battle supported by religious zeal or even by patriotic enthusiasm. Rather, he goes in with the sportsman's spirit that it is "up to" him to win for his country, which is the modern interpretation of Nelson's signal, "England expects every man to do his duty." To go into battle with that spirit and determination it is no longer necessary to be primed with oratory, but that as a first-class fighting man the soldier be physically fit, confident in himself, generally satisfied with the conditions of his service, and assured that if sick or wounded he will receive the best of care. Given these essentials, the average man, with a reasonable period for learning his trade, will do well. He will fight a good fight and beat his enemy, the more easily if that enemy is sickly, poorly fed, or discontented.

The fact that the maintenance of morale has changed from fiery speeches, appeals to the passions, the rousing of religious fanaticism, or national hatred, to more reasonable means has brought it more within the realm of reason and common sense, and, therefore, more within the proper sphere of the medical departments of armies.

I do not mean to say that faith and zeal and patriotism are dead. They are not. I do mean that they have assumed, relatively, much less importance than in former times. Not only the mental changes of the ages, but the technical changes in the machinery of warfare, the varied and complicated material, the powerful guns and explosives, the vehicles for transportation on land and water and in the air, and the increasing size of armies, all tend to enhance the material side of war and to lessen the influence of magnetic leadership and enthusiastic following. An

army has two supports: physical and mental (or moral). The physical support has become relatively the more important.

To study the relations of any branch of the service, or of any other factor, to morale, it is desirable first to analyze the subject and to state the factors which go to make up morale. These factors may first be divided into those affecting the physical man and those affecting him mentally. The term "mental" is not used in a restricted sense, but to include the feelings as well as reason; the moral and spiritual faculties as well as those purely intellectual. Physical factors are placed first because the physical body is primary in the same sense that the foundation of a house is basic; because the sound mind depends upon a healthy body. The *mens sana* must act through a *corpore sano*. These various factors which in action produce morale may be outlined as follows:

Physical

1. Physique: a sound body in the recruit.
2. Supplies: rations, clothing, shelter, etc.
3. Health and sanitation.
4. Training: physical.

Mental

1. Character.
2. General understanding of aims of the war.
3. Training: mental aspects of.
4. Leading.
5. Moral support by civil population.
6. Comfort: depending largely on 2, 3, and 4 of the physical factors.
7. Victory.

The factors "training" and "recreation" are both physical and mental and cannot easily be divorced.

With many of the factors mentioned above, as: food, clothing, health, sanitation, the Medical Department is directly concerned. With others it may be more concerned in the future. Factors concerned in the maintenance of military morale and the relation of the Medical Department to them will now be considered in some detail.

PHYSICAL FACTORS

Selecting Recruits

To the Medical Department is given the task of passing on the physical and mental qualifications of every officer and soldier in the army. Here, theoretically, is the place to reject all men who through physical or mental defects would prove of no benefit or who might even prove a detriment to the army in the field. Men with chronic infectious diseases, men of vicious habits, men with psychopathic mentality,

even the degenerate and insane apply for enlistment. These are generally rejected, or, if they slip by, are detected and eliminated later. One type especially dangerous to morale is the chronic grumbler, the man who is always dissatisfied. Such men incite others to infraction of regulations, and at times stir up small mutinies. They are akin to anarchists and bolsheviki, and perhaps will be found in increasing numbers in the near future. Frequently they are degenerates or of abnormal mentality, and should be transferred from the line of the army to labor corps or detention barracks, if not subjects for discharge. Venereal cases offer another problem. The chronic venereal case is commonly of little value to a company. He was not allowed to go to France; he will probably not be accepted for first-class service in the future, as he should not be.

Along this line the medical officer cannot effect any great improvement in morale, but he can maintain a high physical and mental standard and thereby contribute to a high morale. Physical soundness is the foundation of soldierly achievement; on it all other military virtues are built.

Elimination of the Unfit

A few unfit men find their way into the army, unfit either physically, mentally or morally, and become a detriment to it. At best they are so much dead weight to be carried; at worst they infect others with disease, bad habits, or criminal tendencies, and often commit serious military or civil offenses. Such men are those affected with chronic venereal disease, drug addicts, drunkards, sexual perverts, the insane, and criminals. In addition to the detrimental qualities mentioned, these men by their disgraceful acts, which sooner or later are chronicled in the newspapers, bring discredit on the army as a whole. This is most undesirable, for no army can have a morale of the highest standard without the general approval of the whole body of public opinion. The army should be sustained by public opinion in time of peace; it *must* be so sustained in time of war.

On the Medical Department this rather unpleasant duty of purging the army largely falls. For most of the above-mentioned defects and disqualifications medical officers are expected to make a definite decision as to elimination, and usually to detect the undesirable. As a rule, medical officers are active and energetic along these lines. They detect the diseased, the insane, and the degenerate, but the process of elimination often is slow. This was well illustrated in the great training camps during the year 1918, when tens of thousands of chronic venereals were held in service, with no benefit to anyone and at tremendous expense

to the Government. A high morale among these venereals themselves was impossible, and their presence tended to lower the morale of all who came in contact with them.

Supplies: Food, Clothing, Shelter

These necessities of life, much more of physical efficiency, minister first to the body and in a lesser degree only to the mental resources and activity. It is difficult to determine the exact measure of the beneficial effects of the creature comforts on soldiers, but without doubt it is very great. The influence of environment on the mind is generally accepted. The exceptional man, the genius, rises above his environment, men in the mass are generally governed by it, as Buckle has so ably contended. In the old wars of religious fanaticism—no longer possible—enthusiasm, faith, and zeal made up for many shortcomings of equipment and supplies. Even in the days of faith, material things were necessary. The patriotic soldiers of the Continental Army mutinied in 1780 because of lack of pay, clothing, and food. Morale was completely broken down by purely physical factors, supplies existing in the country itself but not furnished by a supine government. And when the war was practically won, the Puritans of Connecticut were on the point of mutiny, at West Point in 1782. The patriotic zeal of that period was not sufficient to prevail over hunger and nakedness. Much less will morale prevail over lack of the necessities and comforts of life, in these days when faith and enthusiasm are largely things of the past, when the armies of both contenders are raised by draft and when both sides are convinced of the righteousness of their cause.

War has developed into a vast business, like building the Panama Canal, or operating a transcontinental railway system. Mental soundness of view, belief in a righteous cause: these are certainly necessary; but fully as much, and more so than in the old days, is it necessary to keep the soldier well fed, clothed, paid, and in a state of comfort and general satisfaction. As enthusiasm, zeal, or fanaticism have declined, the material side must be handled more efficiently. The very existence of a morale department is proof of this changing, and changed, status of morale.

In order to obtain the maximum efficiency of soldiers it is absolutely necessary to keep them physically sound and healthy, in the most vigorous condition of body and mind. Such condition alone will enable them to withstand the hardships of the march and camp, the shock of battle, and, above all, the depressing effects of defeat that sometimes must be endured. It may seem sacrilegious to say so, but I firmly believe that the physical comforts supplied to our soldiers of the American Expeditionary Forces by the Y. M. C. A. and similar organizations were of

distinctly more value than were the religious aids which they offered. The days when Cromwell prayed before the whole army at Dunbar have gone by, and the days when chaplains of the Continental Army every morning led the troops in prayer, have passed: so much the worse for us, many will say. War has become more and more material, more and more a matter of engineering. Leaders of real genius no longer are seen, no longer even expected. They appeared only once in the life of a whole nation in the past. But men of sound ability, of broad views, of what may be called engineering skill, will always be found. These men do not inspire nation-wide enthusiasm, nor do they evoke new and unseen forces. They depend upon the best use of material means ready at hand. They are practical men who win by securing and using superior resources in men, money, and supplies. The winning side is the one which can overbalance the other in these prime resources. But, since all these essentials are limited in the total, the winning side must make the most of every resource. Every man is a human machine, capable of expending so much energy—when well fed, clothed, equipped, and in a healthy state of body and mind. To maintain him in this happy state is to make him a good soldier in so far as it can be done by human means. The average soldier of today is no longer deeply religious. He will fight well if properly trained, supplied with necessary weapons, his stomach filled, feeling fit, and reasonably well satisfied.

In measures for putting and keeping the modern soldier in this much-to-be-desired condition the Medical Department is deeply interested. As to food, the surgeon has clear supervision and ample authority. He can decide if it is of good quality, properly supplied, and in quantity and components sufficient for the purpose. As to clothing, his authority is scarcely less. If any part of the clothing supplied is of a nature to interfere with the health and vigor of a man, the surgeon can complain with the certainty of being heard. Changes made in army shoes during recent years afford evidence of the influence of medical officers as to the clothing of troops. Over heating, lighting, ventilation, and the various aspects of shelter the Medical Department has authority, nominally advisory but actually much more than that. The medical officer is the specialist in these lines; his advice cannot be disregarded. It is his right and his duty to inspect all these things, to report on them and make recommendations for their betterment when necessary; and his advice, if well grounded, is accepted. The fact that the health of troops has been so improved by sanitary betterments that there are now in armies not one-half the number of deaths from disease in time of war that formerly occurred in times of peace, is the best proof of the influence and power of medical departments.

Even if it be true that the moral (mental or spiritual) is to the physical as three to one, the moral is very largely dependent on the physical; and more and more so as civilization advances. In primitive times men were governed almost entirely by their feelings and could be swayed by appeals to these feelings. Humanity has gradually advanced to the stage of reason, and appeals to the feelings have less and less effect. Not only must the reason of men be appealed to, but they must be treated in a reasonable manner. Nine out of ten complaints and mutinies of soldiers arise from lack of physical necessities. Feed them, clothe them, shelter them, pay them, provide care for the sick, and mental conditions will generally take care of themselves. There are other factors, but these are fundamental. It may be firmly maintained that this is three-fourths of the contest. Physical health and vigor have a double value; first in themselves, and, second, as mainstays of mental health and vigor.

Health and Sanitation

The importance of sanitary camp sites, kitchens, latrines, and the like in their relation to health, and consequently to morale, cannot be overestimated. In order that a soldier be of good morale he must be in good health. In order that he be in good health he must have something more than food, clothing, and shelter; he must live under good sanitary conditions, he must be protected against disease. Sickness quickly destroys the morale of the individual soldier, and, if widespread, undermines the morale of those not actually attacked by disease. Armies have been ruined by disease alone; not only the ancient army of old Sennacherib, but in modern times and with well-attested historical records. Everyone is familiar with the story of the British army of 40,000 men completely annihilated by disease on the island of Walcheren in 1809. About the same time not one but several French armies were destroyed by yellow fever in the West Indies. In 1775-76 the Continental Army in Canada was almost completely destroyed, rendered helpless and unable to defend itself, by smallpox and typhus. So recently as 1898 our little American army in Cuba was brought to a state of almost complete helplessness and had to be removed because of malarial and yellow fever. Fortunately the campaign had been quickly won. Many other such instances could be cited, but this is unnecessary. A sickly army is a weak army.

Sickness as it affects armies is made up almost entirely of infectious diseases: formerly smallpox, typhus, cholera, the plague, typhoid, and dysentery; to day, chiefly, respiratory diseases and venereal disease. To combat and prevent all these diseases is the special duty of the Medical Department. In the last century all of the diseases most

dreaded in former times by commanders of armies have been conquered: smallpox, cholera, typhus, and, finally, yellow fever and typhoid. But one group remains, and its end is probably near. Yet, on account of the irregularities and emergencies of war, disease—even infectious disease—will remain. It will be impossible, at times, to prevent exposure to inclement weather, the drinking of impure water, and insufficient or improper food. Disease will have to be watched; “eternal vigilance” will be the price of healthy troops.

A feature in the life of soldiers, formerly almost entirely neglected but now properly studied and handled, is that of cleanliness, the laundering of clothing, and the prevention of lice and scabies. Less than seventy-five years ago no attention was paid to these things. Soldiers wore the same underclothes for months, seldom or never bathed, and when sick or wounded lay on straw, in so-called hospitals, still clothed in the dirty garments of the march and of battle. Aside from danger of disease, such conditions did not tend to comfort, to self respect, to high morale. During the recent great war our people learned, apparently with surprise, that soldiers in the field become lousy. The British Army, already three years engaged, had devised plans on a large scale for bathing soldiers, delousing them, and furnishing them with clean underclothing. This was a long step forward in sanitation and also in maintaining morale. In this age of bathtubs, the lack of bathing and clean clothes, to say nothing of louse infestation, is a very great discomfort and a condition incompatible with smart soldierliness. In future, the Medical Department will be largely responsible for the maintenance and operation of these bathing and delousing establishments, if not in actual charge of them.

Care of the Sick and Wounded

One means of preserving morale which appeals to every soldier is excellent care of the sick and wounded. The man who risks his limbs, even his life, expects in return the best that the Government can give. If it is not given, if he sees his wounded comrade neglected and abandoned to his fate, he becomes dissatisfied, he is no longer loyal, and he may even desert to his home, or to the enemy. The stories of men who desert to the other side for better clothes, food, and pay are not all apocryphal. Letters of officers of the Continental Army were full of complaints of the sufferings of the sick and wounded soldiers, and special emphasis was laid on the prediction that men who had suffered or who had seen such things would not reenlist. They reasoned, and rightly, that soldiers who saw their sick comrades suffer, without the consideration due their sacrifices, would lose respect for their officers and the Government, would deteriorate in morale, would not reenlist,

and might do even worse. One of Napoleon's marshals, Marmont, wrote on this subject and made clear that it was of the highest importance to the confidence and morale of a soldier to know that if sick or wounded he would receive the very best possible care.

Venereal Diseases

The subject of venereal diseases is of sufficient magnitude to justify a separate heading. Barring epidemics, no other disease ordinarily produces so much loss of time by soldiers. In the year 1917, in the United States Army, measles with all its complications caused a non-effective rate of but 2.63 per 1000; while venereal diseases caused a noneffective rate of 5.43 per 1000. Venereal disease not only attacks many men; it affects them for a very long time and is very liable to recur. In many cases it has a peculiarly depressing and deteriorating mental effect. Every medical officer has seen fine soldiers, often noncommissioned officers, dejected, discouraged, broken down, and in despair through venereal disease. The man who contracts venereal disease is especially prone to lose self-respect and to be looked down on by his more virtuous or more fortunate comrades. The slack or slovenly appearance of a ward of venereal patients is a matter of common notice. Such wards tend to a falling off in discipline and to lawlessness. The average venereal patient, like the average convict, imagines that it is not he who is to blame but that he is the victim of a malignant fate. He is resentful, feels that everybody is against him, and he turns against everybody. This is human nature. The net result is bad for the man, and bad for the army in proportion to the number of such cases. While not a mental state communicating itself to others, it does seriously injure the morale of many individuals; and as many men are transferred to hospitals, altogether much harm is done. To reduce the amount of venereal disease, and thereby increase morale becomes, then, an important duty for all medical officers. In time of peace, now that the drink evil has been largely eliminated, there is scarcely any single factor which has a greater bearing on morale. In time of war venereal disease is relatively less important, yet by no means to be neglected. Plans and measures for securing freedom from venereal disease have been thought out and perfected; the execution of those plans is as yet irregular and at times imperfect. By the utmost energy and vigilance, instruction, provision of effective prophylaxis, enforcement of the use of means provided, and effective treatment: by all these measures can the medical officer reduce the amount of venereal disease in the army, and thereby improve morale. All will admit, I think, that ten cases of venereal disease are more injurious than are ten cases of any ordinary disease.

MENTAL FACTORS

Character

Character is the foundation of soldierly as of all other virtues. It was character that Cromwell had in mind when he said, "I have raised such men as had the fear of God before them and from that day to this they were never beaten." It cannot be disputed that Cromwell's "New Model" has never been excelled by any army, if, indeed, it has ever been equalled. The morale of Napoleon's Grande Armée was not so high, based as it was on military glory and a succession of victories. When defeat came it collapsed. While an army of today, tremendous in size and drawn from the entire population, cannot be picked like Cromwell's small, compact body, in a general way men of bad character may be excluded or eliminated, and something may be done to improve the character of the whole. This is, of course, the most intangible and therefore the most difficult of all problems of morale. It involves Americanization, instruction in patriotism, freedom from vice, improvement of education, morals, and all the problems connected with character building in any school or college. The ideal army will convert raw, human material into models of soldierly virtue as does—or should—a great university convert young men into professional experts, dowered both with knowledge and character.

While drills and instruction, example and precept, in a general way contribute to morale, there are other and more definite methods of procedure for securing the desired end: such as the work of the various auxiliary associations, camp welfare activities, schools, maintaining relations with relatives at home, religious services, libraries, intercourse, and social relations with the better class of civilians, and, of course, elimination of intoxicants, gambling devices, prostitutes, and bad characters generally. No one who had experience in the great camps of 1898 and those of 1917-18 could fail to be profoundly impressed by the difference between the two. While the men coming to these two sets of camps were not essentially different, their management and the results of this management were vastly different. In 1898 there was almost no camp welfare work. Saloons abounded, as did worse places. Large bodies of young men were left to their own devices during spare hours and holidays, and in many cases this naturally led to bad results. Drunkenness was common, and in a number of camps there were brawls, outbreaks of rowdyism, and even insurrections. In the camps of 1917-18 saloons and other vicious resorts were generally eliminated; the tough soldier was not the approved type; the men did not lose the qualities which mark home life; did not deteriorate. It was the general opinion

of commanding officers that the men were tractable and easily managed. Discipline when reasonable was not at all difficult to maintain.

The lesson in this is that a large body of soldiers at the beginning reflect the character of the civilian population, but when segregated, and especially under the influences of war, tend to deteriorate in morale. It may be too much to expect them to improve; the main task is to prevent them from growing worse. In some points they may even be improved, as in discipline, loyalty, neatness, a sense of order, health, patriotism, and a broader knowledge of the world and of humanity. In some of these particulars medical officers have a direct part and a plain task; to all they may lend their support and influence. They always have their own fraction of the army to mould and shape.

Understanding of Aims

This refers largely to aims in war, and little need be said. In these days of many newspapers and general education, most men have a fair understanding of the ideals and aims of their government when it undertakes to make war. Only the illiterate, or foreign born, need to be instructed in order that they may know what they are fighting for.

Training

Training is one of the greatest aids to discipline and morale. Even the old, close-order drill had marked value. In fact, it is quite probable that the mental, or *morale*, value of this drill is greater than its physical value. To learn order, precision, smartness in movement, obedience, alertness, concentration, instant action: these constitute a mental drill of the greatest value. Scarcely less worth learning is the value of cohesion, of mutual support, of combined action, of the power of massed men moving with one thought and one aim.

Discipline

Discipline and morale in an army are so intimately associated that it is difficult to separate them. At first glance they may appear to be identical, but they are by no means the same. An army can have a fairly good morale without good discipline. An army with good discipline almost necessarily has good morale. During the American Revolution, Continental armies with lofty patriotism and high zeal, fairly trained and supplied, were often beaten by superior discipline alone. They were beaten by hirelings, mere mercenaries! Discipline alone, with no superior arms or leaders, enabled hired soldiers, without any incentive but pay, to beat men not so well disciplined, fighting on their own ground, as they believed for freedom, their homes, and all they held most sacred. Discipline today is more intelligent, but now

that faith, zeal and enthusiasm have largely departed, it is of more importance than ever before—not the blind discipline of brute force, but the intelligent discipline which rests on a knowledge of the necessity for method, regularity, order, and obedience.

The relations of the Medical Department to discipline are both direct and indirect. The Department is responsible for its own personnel, which in the A. E. F. amounted to more than eight per cent of the whole army in France. If one were to make inquiry secretly among a number of line officers as to the discipline of the hospital corps he might be surprised to learn that many of these officers thought the discipline of that body not equal to the discipline of combat troops. There are differences between enlisted men of the Medical Department and those of the line which account for some differences in discipline; yet it may well be that this subject should be studied with a view to determining whether or not the discipline of the Medical Department is up to the proper standard, and if not, how it can be improved. No branch of the service can be efficient without good discipline. Discipline is not the end; it is but the means, yet a most powerful one.

The Medical Department has various contacts with the discipline of the army as a whole. It can, negatively, be careful not to interfere with discipline in any way. It has considerable importance in hospitals, detention barracks, and prisons. The soldier who, to escape military duty, malingers comes under the eye of the medical officer and should be detected. The accused prisoner who pleads insanity or some borderline condition as an excuse, is turned over to the surgeon to have his status determined. Decision as to line of duty cases, venereal disease, accidents, fights, and the like often have a bearing on discipline. The medical officer frequently sits on court-martial, may be counsel or even president of the court. In such cases noncombatant officers, as surgeons or chaplains, sometimes show a tendency to universal leniency. Discipline does not abolish mercy, but justice demands punishment for serious offenses; otherwise men find that such offenses may be committed with impunity. In a word, the medical officer, like every other officer, must always remember that maximum efficiency and the best morale are not possible without a high state of discipline. He must never interfere with it, but, on the contrary, must lend every effort to its maintenance.

Leading

The power of leadership, its direct influence on men, has perhaps declined; due in part to the widespread field and in part to increased intelligence of the masses of men. The inspiration of personal leadership is not so necessary. The individual man has his own resources of

character and sufficient intelligence to guide him in the details of his duties. Yet the influence of leadership has not departed. If the higher ranking officer has been removed beyond his reach and is no longer the personal hero that Napoleon or Washington was, subordinate officers are still in contact with him. The major, the captain, and especially the lieutenant: one of these is still before him—his guide, philosopher, and friend, and, if worthy, the object of his emulation. As is the captain so will be the company. Somewhere there is still a leader, in theory a more intelligent, more skilful, braver and better fighting man than any other in his company. To transform this theory into fact is one of the most difficult but one of the most important of all the tasks of military men. Unfortunately not all leaders, not all officers, are such examples of excellence, and it is in part from this failure to reach the ideal that the morale officer has come, though the principle of the division of labor would of itself warrant such an official.

Morale Officer

One of the factors of the Great War was a morale division, with a chief and subordinate officers in all divisions, brigades, regiments, etc. Since morale has been taken out of the domain of the supernatural and placed on a basis of reason and common sense, this was to be expected. It is also logical and proper that the morale officer of a combat corps, say, an infantry regiment, should be a combat officer. Yet there are reasons why the medical officer should at least have close relations with this morale officer. The medical officer can give the latter information as to the health, stamina, and measure of endurance of the command as a whole. He can give more particular information as to individuals. He frequently can approach soldiers more intimately and can learn of their troubles, real or imaginary, more easily than can line or morale officer. The medical officer generally knows if there is dissatisfaction with rations, clothing, or shelter; if there are liquor joints or houses of ill fame about the camp or post; if there are degenerates, drug addicts, or men with criminal tendencies in the ranks. If the difficulty transcends such concrete matters as meat, bread, blankets, and the like, and really reaches the more intangible things with which the mind deals, then the medical man should be an even more valued adviser; for in the course of his professional studies he has become more or less familiar with mental phenomena, the vagaries of soldiers, psycho-analysis, and psychology in general. He has probably had more experience along those lines than the average line officer and can handle such problems more intelligently. It would seem that in such a case as the general undermining of the morale of a whole army of one of the allied nations,

as occurred during the World War, the medical officers of that army could hardly have failed to know what was going on. Certainly in an American army the Medical Department would not be blind to it.

Since morale depends so largely on the factors with which the medical officer has relations, and over which he very nearly has control, he should be in close touch with the morale officer and can give the latter most valuable information.

Moral Support at Home

This is a factor which in ordinary times does not appear to be important, but when real stress comes it is vastly important; and when failure stares an army in the face the moral support of the home population is absolutely vital. It is then seen that the army is like the upper story of a great building, of which the foundations and lower floors are formed by the nation as a whole. When the Russian Government disintegrated the army fell to pieces like a house of cards. When the German nation lost faith, the army weakened. This great factor in morale is one in which the Medical Department is interested only as the whole nation is interested. Medical officers have no more interest in the soundness of this bulwark of the army than have other officers; neither have they less interest.

Recreation

Provision for the physical wants of the soldier must always be the first care in maintaining morale; but scarcely less important is the necessity for ministering to his mental needs. It may all be summed up in a single sentence: the soldier must be comfortable and content. He must first have shelter, food, clothing, and sanitary surroundings. In addition to these he must have recreation, ranging from athletic games to song services and motion picture performances. No longer is he an ignorant and idle fellow, but a man of intelligence, often of considerable education; in many cases college bred. To a man of intelligence, mental food is very nearly as necessary as physical food. Not all of a soldier's time can be given to drills and military exercises. He must have some leisure, but not long hours of idleness with their attendant dangers. This need for recreation and diversion was recognized during the recent war. The soldier coming from the front; exhausted in body and mind, hungry, dirty, and lousy, sick or nearly so; was fed, bathed, and deloused; given clean clothing and bodily comfort; his minor ailments attended to; with a short rest and suitable diversion, he was not only restored to health and strength, but his past troubles were dimmed or forgotten, and he was again ready to enter the fighting line with all his original vigor and energy.

There is a long list of these recreations and diversions provided in the army itself or by the various auxiliary organizations, as the Red Cross, the Y. M. C. A., and other similar agencies. The medical officer has relations with all these and can, at least, give his sympathy and moral support to them. He may take a more active part in some of them, especially in the athletic games and sports, which are not outside the sphere of his proper labors. Games which develop strength, skill, and endurance are of the utmost importance in securing an army of vigorous men, and this is one of the chief aims of the Medical Department. Entertainments, dances, theatrical performances, and other means catering more to the mental needs of the men, do not come so directly within the limits of sanitary measures. Yet there is no reason except custom, and an unjustifiable custom, which would exclude them. These activities bear the same relation to the mental soundness of men that games and sports and physical exercises do to physical health. The Medical Department is no less interested in the mental health of the army than in its physical soundness.

The influence of the more refined sex, when of the right variety, without doubt is a valuable aid in maintaining morale. No man was ever made a less valuable soldier through the influence of a good woman. While morale and morals are not precisely the same thing, good morals in general tend to good morale, and the sex which has a higher standard of morals will certainly have a good influence on the morals and morale of the army, if utilized and brought to bear properly. The women members of the Army Nurse Corps, Red Cross, Y. W. C. A., and other organizations in France were of inestimable value not only in caring for the sick and wounded (where there is no substitute for a woman) but also in furnishing the ever-in-demand eatables and other comforts, recreation, mental diversion, and by the intangible but none the less definite stimulus resulting from the association of one sex with the other.

All these auxiliary agencies had more or less direct relations with the Medical Department. The Army Nurse Corps, most important of them all, belongs to the Medical Department and is an indispensable part of it.

The Red Cross Association is under the direction of this Department, as laid down in regulations, acting as a valued aid. Its aims are those of the Medical Department; it is necessary and logical that they work together. The Y. M. C. A. and similar organizations do not come in such direct relations with the Medical Department; yet as their aims are practically the same, merely directed in different channels, it seems probable that these bodies will eventually be brought into close relation with the Medical Department. All these bodies have the same general

aim: the welfare of the soldier. In the beginning in this country there were but two branches: the Sanitary Commission, which looked after the bodily needs of soldiers (particularly of the sick and wounded), and the Christian Commission, which looked after their religious or spiritual needs. In the course of time these two divisions have increased and multiplied, until now they are many; but they may still be divided into two great classes, those ministering to the physical man and those ministering to the mental—or spiritual, if you will. It is highly probable, even necessary, that all these bodies be coordinated under one head. What more natural and logical head could be found than the Medical Department of the Army? No other Service, Line, or Staff is so well qualified to direct them. It is in the hospitals or dispensaries that men are in the greatest need of aids to both body and mind. It is to these that soldiers turn for aid and it is to them that the societies naturally apply for information as to what is needed. In the battles of the Meuse-Argonne, when the officers of the combat divisions were fully occupied with their tremendous task, hundreds and thousands of men, not actually sick but weak and exhausted, turned to the field hospitals for warm food and drink, a little rest and comfort, encouragement, and mental stimulus to face the enemy again. These hospitals were as far forward as the Red Cross, the Y. M. C. A., and similar societies could usually work in time of conflict. If they could get farther forward it was the regimental aid stations that were the natural centers for their labors. There were congregated the men who were failing in bodily or mental strength, and these aid stations were the natural places, not only for assisting the lame and sick but also for giving out chocolates and doughnuts to the perpetually hungry soldier. It was a curious fact, never understood by the French, that the American soldier was forever eating or drinking something; his appetite was never satisfied. In this fact is some instruction. Give the soldier enough chocolate, harmless soft drinks, doughnuts, and such light food and he becomes the happy warrior whom no labors tire, no dangers daunt. And there is sound physiology in this as well as sound psychology.

Effects of Victory and Defeat

Aside from ardent patriotism and fanatical religious zeal, there was in the old days of natural morale no factor which more definitely and more surely raised morale than victory, and none which more surely depressed it than defeat. These factors still operate but not in so powerful a degree as formerly. They are spoken of as natural factors, because they are not influenced by teaching or propaganda. The latter may be termed artificial factors, though not really so. There are no really arti-

ficial factors in maintaining morale. Those so called are merely studied means of utilizing naturally existing physical and mental factors, as when patriotism is awakened and nourished by the written or spoken word. Patriotism must naturally exist before it can be stirred by oratory or by the written call to arms.

In spite of the more determined and lasting morale of modern times, victory, particularly at the beginning of war, is of great value. The slaughter at Bunker Hill was forgotten by no British leader during the War of the American Revolution. The Confederate victory at Bull Run prolonged the Civil War a year or longer. Victory always inspires and strengthens the winner; it depresses and discourages the loser. Confidence is greater or less after every decisive battle.

In winning a battle the Medical Department has no great direct part, but an important indirect part. The Department is responsible for keeping the ranks full on the day of battle, not depleted by disease. It is also responsible for having the men enter the conflict strong and in vigorous health. Weak armies are beaten; sickly armies are beaten. Napier gave the Medical Department of the British Army credit for the victory at Vittoria, where he said the battle would not have been won but for the 5,000 troops restored to the army (from hospitals) by the efforts of medical officers. Other instances have been mentioned to show the effect of disease in rendering an army unfit for battle. It is, then, the *rôle* of the Medical Department to have the army ready to fight, prepared to win in the desperate game of battle, and in this manner to raise and maintain its morale. The Medical Department will do this by performing its own special tasks in the most energetic and efficient manner possible.

FINALE

To attain a high morale may well be the highest aspiration of every officer and man in the army. Morale is the spirit, the soul of the army. With high morale all things are possible. It was the spiritual morale of the French Army which enabled it to turn at the Marne, to go forward and die in place rather than retreat. It was the morale, more material and dogged, perhaps, of the British Army which enabled it to make the final stand with back to the wall. It was morale that enabled both armies to withstand four years of failure. It was the morale of the American Army, built up from the first days in camp, nurtured by all possible means and sustained by all the material necessities and comforts, which carried that army through the hills of the Meuse and the forests of the Argonne to final and complete victory. And the fact that the German Army was no longer unfalteringly supported at home, that its morale was at least impaired, contributed largely to its ultimate

defeat. There are two supports to the structure of an army, material and moral, the loss of either of which allows the edifice to fall.

The means by which morale must be maintained have been adduced. They are not supernatural. No royal short cut to morale will be found. Natural means applied logically will be looked to by reasonable men, and alone will secure the desired result. What part, then, will medical men have in the task? As has been indicated already, they will aid in the task in two ways: first, by and far the more important, they will perform their own duty well. The performance of that will secure soldiers of sound mind and body, will maintain them in physical and mental vigor, ward off infectious diseases, care for them when sick or wounded, contribute largely to their comfort and satisfaction, and generally either manage or guard the principal supports of military morale. In an army as in other large organizations, the general objective will be best attained by each individual doing his own part well, not by each man assuming a part of the duties of others. Each should aid any other when called upon, but, as a rule, only when called upon. There may be exceptions to this general rule, but such exceptions do not annul it.

Secondly, all medical officers should understand the high value of military morale; that it is absolutely necessary to a successful army. They should, therefore, lend their aid and encouragement to all those means and agencies, previously enumerated, the main direction of which is given to others. These are such factors as: the morale officer, training and discipline, leadership, moral home support, educational activities, camp welfare service, and others; over which they have no direct control outside their own department.

The medical officer will be a morale officer in his own department, and, exceptionally, in other branches of the Service. In all branches and all activities of the Army he may contribute largely toward providing that army with a sound physical body and giving it a living soul, a quickening spirit.



THE PART OF THE MEDICAL DEPARTMENT IN MAINTAINING MILITARY MORALE

HONORABLE MENTION, WELLCOME PRIZE ESSAY, 1920

BY LIEUT. COL. GUSTAVUS M. BLECH

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Morale—State of mind with reference to confidence, courage, fidelity, and the like, especially of a number of persons associated in some dangerous enterprise, as soldiers in war.—*Standard Dictionary*.

FOREWORD

IN preparing the following essay, the author has been ruled by the specific purpose of establishing the military value of the Medical Department through its influence on military morale, by arguments which should interest not only the personnel of the Medical Department but line and staff officers in general.

It is believed that the greatest possible amount of good is attained by extending desirable doctrines to all concerned, and not merely to a restricted class; likewise the formulation of a philosophy of the military medical service must be prepared so as to be accessible to all branches of the military service—and to the general public for that matter—since a just appreciation of the true character, function, and value of a part of a hierarchy leads to reciprocal relations based on equity.

I

“Military Morale” is that attribute of organized military forces which expresses itself in a firm determination to win victories in war, regardless of the hardships and dangers involved.

“Confidence in leadership, courage, fidelity, etc.,” are merely some of the factors by which military morale is attainable. Accordingly, the definition given by standard dictionaries does not clearly nor fully convey the true meaning of that military psychology which is the ultimate goal of military discipline.

The development of military morale is part of the many onerous duties of those line and staff officers who are charged with the instruction and leadership of the combatant forces. It is their special province to transform recruits, accustomed to the more or less normal life in civil communities, into soldiers; that is to say, into men, who can be relied upon to execute hazardous military missions without yielding to the natural instinct of self-preservation in the face of probable injury and death.

Theoretically, at least, this is accomplished through discipline, example, inspiration, and the like, but, as a matter of fact, the problem

involved is not simple, since in the preparation for war so many psychic and physical factors have to be taken into account that modern strategy must be considered an art as well as a science; for science can deal only with immutable principles, while art takes cognizance of conditions which cannot be calculated.

In war it is the ever present *human element* which dictates valuations in a psychologic sense.

In times of peace, that is to say, in the preparation for war, the development of morale is accomplished on strictly scientific principles. Confidence in leadership is inculcated by fixed and accepted methods, courage is developed through example and suggestion; fidelity and patriotism through methods of inspiration, and thus after a more or less prolonged course of practical psychology engrafted on purely physical means—the drill—one may reasonably hope to have developed a human military machine which will function automatically at the will of the leader.

Such an ideal, unfortunately, is never attainable, at least not fully. It is one thing to *develop* morale during the period preparatory to battle, and quite another thing to maintain morale in battle, especially during the vicissitudes of prolonged warfare, for it is then that the human element sooner or later will assert itself in one form or another, and failure or success will depend on the preparations made to meet any possible contingency.

It is the aim of modern strategy to provide any and all measures which experience has shown to promise success in campaign, but no preparation is complete which bestows no attention to the human element of military psychology.

II

The question presents itself: What part has the Medical Department in the maintenance of military morale?

If we consider the military value of the Medical Service of the Army or Navy, we may expand the question to read: What part has the Medical Department in the development and maintenance of military morale?

To answer this question intelligently, it is essential that we must all agree on the true function and status of the Medical Department.

Army Regulations say:

The Medical Department is charged with the duty of investigating the sanitary condition of the Army, and making recommendations in reference thereto; of advising with reference to the location of permanent camps and posts; the adoption of systems of water supply and purification and the disposal of wastes; with the duty of caring for the sick and wounded; making physical examination of officers and en-

listed men; the management and control of military hospitals; the recruitment, instruction, and control of the enlisted force of the Medical Department. . . and furnishing all medical and hospital supplies.

It is evident from the regulations¹ that the Medical Service has the dual function of sanitation and the care of the sick and wounded, and, at first sight, it may appear that all in all the Medical Department has strictly technical duties which have no relation whatever to warfare.

Since this erroneous view unfortunately is held by many—altogether too many—line and staff officers, as well as by a large part of the civilian medical profession, it results that to them the strictly professional character of the Medical Service represents the sole *raison d'être* of the Medical Departments of the military-naval forces.

Such a conception of the Medical Department has caused many line and staff officers to look upon sanitary personnel as mere professional adjuncts to the Army and Navy.

While the written law has assured the Medical Department full military status, compelling official recognition, mere formal bowing to the letter of the law is not conducive to harmonious cooperation with and by all other combatant and technical branches of military forces.

Though it may seem that any discussion of the military status of the Medical Department is beyond the scope of our subject—being one of caste, without any possible relation to the problem involved—it is, nevertheless, of sufficient importance to merit detailed consideration, for whenever in any hierarchy the status of a class of functionaries is not exactly defined, friction and misunderstandings are bound to arise, and teamwork is so hampered that the efficiency of the whole is lessened. Inefficiency represents favorable soil for a fungus growth which has a tendency to undermine morale. It is for this, if for no other reason, necessary to prove that the medical service is military service in the fullest sense of the word, and, therefore, highly essential to the proper conduct of warfare.

To accomplish this in a manner satisfactory to all concerned, it is needful to review the diverse duties of the Medical Department and to establish their military significance. These duties may be grouped in two principal classes:

1. Duties of a character to prevent and eradicate certain influences likely to diminish or weaken morale before battle; and
2. Duties of a character which contribute towards the maintenance of morale during battle.

If, as we shall show, these are the true functions of the Medical

¹ We do not quote Navy Regulations because they are essentially the same, and all that is said in connection with the Medical Department of the Army applies equally to that of the Navy.

Department, their military value and character not only permit no further dispute, but assume the importance attached to any strategic or tactical problem.

III

War is today a national problem. Time was when wars were fought by professional armies, and the state which had the larger number of battalions, and the means of getting them to the battlefield quickest, could prognosticate a successful issue. Today when two mighty nations have decided that their differences cannot be adjusted except through a resort to physical force, the nations and not the armies alone are at war.

The mobilization of the nation's finances, industries, and other material resources necessary to make war possible does not concern us here, and we shall therefore restrict our discussion to the mobilization of the man power for actual combat.

The Regular Army and organized auxiliary or reserve forces may serve as a nucleus for a large national army, or they may serve as a buffer until the main forces can be mustered for a decisive conflict, but whichever their mission may be at the beginning of a war, the principal problem we confront concerns the partly trained or untrained levies; a problem whose difficulties are in direct relation to the sanity of a military policy that must have been in vogue for a sufficient time before mobilization to render it effective when needed.

Even if we ignore for the United States the question of the limitation of man power² and admit, for the sake of argument, that our General Staff can devise, if it has not already done so, a scheme by which our military man power can be mobilized with great rapidity, we cannot admit that a rapid mobilization is synonymous with an effective mobilization.

The last war has clearly shown the fallacy of mobilization without an adequate military medical service. Thousands of young men have been called to the colors, uniformed, equipped, transported, and trained for some time at great cost to the people, only to be discharged from the Army as unfit, for causes which should have been discovered at the first physical examination.

Modern war implies tremendous physical and mental hardships. Napoleon has rightly placed ability to support fatigue and privation above physical courage.

² European statesmen and military statisticians have credited the United States with an unorganized militia strength of about 13 millions. If this were so our military man power would be practically inexhaustible. The World War, however, has shown that this estimate has been greatly exaggerated as far as effective military strength is concerned.

Of what value is it to gather an army quickly; that is to say, secure men to fill the diverse military units, when a large number of such hastily collected recruits will have to fall out after the first endurance test and not only leave the companies, battalions, regiments, and higher units weakened numerically, but become a heavy burden on an organization facing a task which will tax every available man to the utmost?

It is here, then, that the Medical Department confronts its first problem—that of the *physical examination of officers and enlisted men recently called to the colors*.

“*Mens sana in corpore sano!*” Only those who have a sound mind in a sound body can achieve things requiring the highest stamina.

Munson, in his excellent treatise on the “Theory and Practice of Military Hygiene,” has truly said: “War and not peace affords the theoretically normal conditions governing the military establishment. . . . the soldier may be called upon at any time to sustain the maximum of fatigue and privation of which the human being is capable. . . . Recruits must be of trustworthy physique and sound constitution before the military character can be developed; and the physically, mentally, and morally defective are hence to be uniformly rejected as unfit for service.”

The Medical Department is charged with the proper selection of military personnel. This duty involves the most painstaking attention to many details. Medical officers are cognizant of the fact that by a perfunctory performance of this duty they would not only handicap the line and staff officers in the great and responsible task of developing an efficient military machine, but also by admitting defectives they would expose a large part of the military family to the possible danger of demoralization at a critical moment. It is the Medical Department, then, which has to take the first, and doubtless the most important, step towards the development of military morale.

Is this a purely medical or a military function?

The second problem which confronts the Medical Department, though the Army Regulations make no specific mention of it, pertains to the undertaking of measures to prevent certain epidemics, which have proven more disastrous, more destructive, and more demoralizing than the bloodiest battles in history. This duty involves the vaccination against smallpox and the inoculation against typhoid and paratyphoid fevers. Today smallpox and typhoid fever have been virtually eliminated from the military forces, not only in peace, but also in active campaign.

Should our troops at any time be exposed to cholera and certain

serious diarrheal diseases (dysenteries), the Medical Department has the means to prevent these dreaded epidemics.

Nor does the medical service rest content with these successes. Advances made in the medical sciences throughout the world are always utilized for the benefit of the soldiers and sailors, and in the great Army Laboratory and the corresponding naval institution research work is carried on for the purpose of preventing disease. Thus, it may be safely stated that the prospect of rendering pneumonia and influenza either comparatively harmless, or preventing their occurrence entirely through proper measures of immunization, is excellent indeed.

Is the prevention of epidemics a purely medical, or is it a military function?

The last of the problems during the period of preparation for war pertains to the preservation of the health of the military forces through sanitation.

From the moment the recruits have been sworn in until they reach the battlefield they are subjected to influences which are very likely to undermine their health or produce certain diseases, in addition to the infectious and contagious diseases above alluded to. It is beyond the scope of this essay to enter into details, and it must suffice briefly to enumerate the most important sanitary activities of the Medical Department.

Instruction in personal cleanliness, the hygienic care of the teeth, the selection of a well-balanced diet, the provision of wholesome water, the control of exercise (drill) and rest, the prevention of disease through proper disposal of wastes, the control of the fly evil, the hygiene of tents or barracks, the correct shoeing to prevent breakdown on marches, and, finally, the prevention of venereal disease, are some of the means by which the Medical Department contributes towards placing on the firing line the largest possible number of men in the best possible condition.

Is the maintenance of the health of the troops a purely medical, or is it a military, function?

IV

An analysis of the duties of the Medical Department during battle presents certain complications which, viewed impersonally, offer no insurmountable difficulties. When the land and naval forces are put to the supreme test, popular interest in the outcome of the battle is aroused, and for the time being the question of victory or defeat is uppermost in the minds of all.

The painstaking labors in the camps of instruction and concentration, the solution of the huge problems of the supply of the forces and their

movement to the front—all these problems which tax the ingenuity of the General Staff, and without which victory would be impossible, appear to the lay world as mere "routine" when compared with the tactical execution of the strategic plans.

As for the rôle of the Medical Department under such tremendously important circumstances, popular interest rests on one question: Is the Medical Department prepared to afford the fallen men the best possible professional care? It would seem that the national importance of victory should arouse in the minds of the people some idea that in war everything is subservient to the one great aim of inflicting on the enemy a decisive defeat; but, unfortunately, not only laymen but also many military persons see in the medical service at the front and the rear only an organized agency for a purely humanitarian function.

That the care of the wounded in itself is a humanitarian function is not denied, but what must be denied is that this function is the sole *raison d'être* of the Medical Department. The fact is—and the quicker it is recognized the better for all concerned—that the medical service at the front and in the rear zones has a decided influence on the outcome of battles, by

(1) Sustaining the morale of the troops on the firing line, and

(2) Human salvage.

The Field Service Regulations charge the medical service with the "methodical disposition of sick and wounded, so as to assure the retention of those effective on the field of battle, and to relieve the fighting force of the noneffective," in addition to the professional care of the sick and wounded and their transportation.

If the "methodical disposition" of the noneffective were a purely humanitarian problem, the entire organization of the medical personnel for service at the front would be unnecessary. All the state would have to do to satisfy the national demands would be to hire or draft a large number of civilian surgeons of acknowledged skill, and send them to the battlefield with instruction to assuage pain and suffering, and to heal the wounds inflicted by the enemy.

Such a step, while certain to win the applause of the masses, would soon arouse bitter indignation, for without a thorough conception of the true rôle of the medical service at the front, even the most skillful surgeons would do more harm than good.

It is noteworthy that the most pronounced protest against any but a strictly military medical service at the front has come, not from professional military surgeons, but from great civilian surgeons who had placed their services at the disposal of their respective governments.

Pirogoff, the brilliant surgical luminary of Russia, and the famous

Russo-German surgeon, von Bergmann, have described war as an epidemic of trauma (injury); and in view of the fact that these epidemics often assume a gigantic size, against which even a large contingent of surgeons must prove practically helpless in their aim of quickly rendering aid to all who clamor for it, organization not only of the personnel but of the methods of care is of paramount importance.

It must not be forgotten that at the diverse aid, dressing, and hospital stations in the zone of active operations there will be times when hundreds of slightly and more or less seriously injured and sick, accumulate very rapidly, and such an avalanche can be mastered only by a purposeful division of labor, always with the military aim of the service in view. At best, medical officers will often be compelled to work incessantly without food and rest for many hours, only perhaps to be compelled to begin anew on another "convoy."

The tendency of civilian surgeons to "individualize," which is but a natural inclination to follow "humanitarian" instincts, will degenerate into paying special attention to "cases" either attracting the surgeon's special pity or arousing his scientific interest. Commenting on such a situation von Wreden,³ basing on his experience in the Russo-Japanese war, rightly says: "It is plain that under the conditions at the front every minute is precious, and for this reason any operative intervention without vital indications which brook no delay . . . is simply out of the question . . . The surgeon owes a duty to the large number of wounded awaiting medical aid, and not to any special individual who arouses the special pity or the scientific interest of the medical officer. Compassion shown one at the sacrifice of tens of others is no compassion." To this may be added that any attempt to perform time-consuming delicate operations in the zone of fire during maneuver war would only lead to disastrous results for the wounded.

Basing on actual experience as developed by modern tactics, and not on humanitarian theories, the medical service confronts problems which it has succeeded in working out so satisfactorily that it can be asserted without fear of successful contradiction that a well-organized and well-disciplined sanitary service at the front can boast of not only saving as many human lives as is physically possible, but of actually preventing unnecessary loss of lives. This is attained through:

- (1) Organization and proper tactical disposition of the service.
- (2) Administration of first aid to save life and to prepare the seriously wounded for safe transportation to the rear for specialistic care, and

³ *Prakticheskoye Rukowodstvo po Woyenno—Polewoy Chirurgii*, Petrograd, 1911.

(3) Definite aid to wounded who can be returned to the firing line immediately or in a very short period.

It is by proper organization and division of labor and the employment of professional methods suitable to the tactical situation of the diverse stations that the medical service attains not only the best possible humanitarian results, but becomes useful in a purely military sense.

We have seen that confidence in leadership is one of the factors producing morale. Leadership implies not only strategic and tactical skill, but provision for the physical and moral welfare of the troops.

One of the greatest problems pertains to the care of the wounded. The Anglo-Saxon and other races have always placed a high value on their lives and bodily welfare, and while military discipline aims so to influence the human mind as to cause the soldiers to face the probability of death on the battlefield without yielding to the natural instinct of self-preservation, even disciplined soldiers fear mutilation and suffering.

Dr. Jean Lemieux, commenting on the sanitary debacle in the Madagascar campaign says: "The soldier knows how to die for his country, he is accustomed to the idea of being struck by the enemy's bullet. On the other hand, the spirit of sacrifice is not sufficiently developed to enable him to tolerate sufferings, which he deems useless. He reports to his superiors the cause of his misery and the resulting demoralization." Knowing, however, that behind him is arrayed a veritable network of sanitary aid stations, formations and hospitals, prepared to maintain contact with him in advance and retreat, and to care for him whenever and wherever necessary, the soldier can face the enemy without worry and devote himself with a carefree mind to the performance of his military duty. Nor does he worry over his fallen comrades. Indeed, the organization of the disposition of the noneffective is part of the tactics on the battlefield in which he has no part without specific orders to the contrary, with the result that the firing line is not unnecessarily weakened through unauthorized absenteeism, thereby disturbing prearranged plans of attack or defense and preventing the full harvest of a victory.

War does not always present tactically ideal situations. A battle that has lasted for some time necessarily results in losses on both sides. Familiar faces soon are missing in the ranks. Whether "killed," "wounded," or just "missing," the absence of a beloved leader or loyal comrade has a depressing effect on those who remain in the ranks.

After a lull, preparations for a new attack are begun. And as at roll call many of the "wounded" report themselves "here," having been returned to the firing line from the aid and dressing stations or

hospitals in the field, the horrors of war are lessened, new courage is infused, and an inspiration for heroism is produced that no word, even from the lips of an inspired orator, can equal.

It is through the early return of the slightly wounded that the medical service at the front achieves its military triumphs, for thereby it not only sustains the numerical integrity of the firing line through rapid human salvage, but enhances the morale of the units going into action. Such triumphs are possible only through sanitary tactics, a science which is no more nor less than mobility of the medical service, enabling it to be where needed, at all times, and to render the best possible professional care to the largest possible number of wounded, in spite of the limitation of facilities dictated by modern warfare.

V

The safety and regulated conditions prevailing in hospitals in the zones at the rear render "individualistic" care of the sick and wounded not only possible, but obligatory. In the sanitary formations away from the turmoil of battle the wounded are, and have the right to be, cared for according to the best scientific methods, irrespective of cost and labor involved. In medical institutions in the rear, the wounded are "patients" rather than "soldiers," and the question presents itself whether there is any need for military sanitary personnel away from the actual front.

But even here the military aspect of the sanitary service must not be lost sight of, for general hospitals are not the final *étappe* in the journey of the wounded from the firing line to the discharge bureau, except for those unfortunates whose services will never again be available. The general hospitals have the mission of curing their charges when a cure is at all possible, and in cases where such an outcome is assured the period of convalescence will be utilized to reeducate the patients for military duty, for it is well known that a prolonged stay in a hospital has a tendency to make all past military training valueless, at least in nonprofessional soldiers. Many have been the complaints by company commanders in the American Expeditionary Forces in France, that soldiers returned to them after prolonged stays in hospitals situated at great distances from the front (base hospitals) have proven so unfit for the resumption of duty that they had to be reeducated for the service.

Investigation has shown that this was particularly the case with base hospitals officered by surgeons, who saw in their professional work the sum total of their "war service." If, on the other hand, the responsible officers appreciated the fact that the hospital was a military institution for human salvage, the so-called convalescent sections became

strictly military organizations with a definite program of military discipline, calisthenics, and infantry drill without arms, graded, of course, to suit the physical condition of the convalescents. When finally discharged for return to duty these soldiers came back to the front ready to take their accustomed positions in the ranks, without in the least betraying the "softening" influence of the hospital atmosphere. Not unlike those who return to their units after a brief sojourn in one of the sanitary formations at the front, the return of seriously wounded, apparently none the worse for their experience, cannot but have a favorable effect on their comrades, the reality of complete recoveries dissipating the fears of uncertainty incident to battle casualties.

When one recalls the enormous numbers of seriously wounded salvaged in the hospitals in the rear, one cannot but acknowledge that these institutions are a veritable source of supply of valuable military manpower. Even if a country has sufficient male adults for even a prolonged and bloody campaign, the drafting of new levies is a costly, time-consuming, and often fruitless task, since the officering of such levies always presents a serious problem. A service which reduces war losses to only temporary casualties, at least to a very great extent, is to all intents and purposes a replacement service and as such enables the leaders to look upon the wounded in a campaign as reserves rather than losses. Surely, then, the professional and humanitarian Medical Department is also a strictly military branch of the Army or Navy, as the case may be, and an integral and invaluable part of the entire fighting force which contributes an important means to victory.

VI

Mueller's dictum that the past is the key to the present applies also to all military problems. Unfortunately, there is no single work extant which will show the influence of the medical service on morale in war. Most historians of the more important campaigns, and especially of those which have occurred since the introduction of firearms as a general weapon of offense by Alba in 1567, have paid scant attention to the medical problems of war. Even the available treatises of war surgery merely deal with technical advances, and if they discuss the sanitary administrative problems at all, they glorify the benevolence and humanitarian sentiments of their royal commanders though we know from contemporaneous observers that conditions have been very bad indeed.

Space and opportunity prevent detailed discussion of the development of the military medical service, interesting as it is. It must suffice, therefore, to point out that some form of rational recruitment, sanitation, and professional care of sick and wounded has existed since

the beginning of intelligent warfare, and we have accordingly no criterion of a war without a medical service. Military uprisings of certain oriental and savage tribes inspired by religious fanaticism are not wars.

Roman history of the time of Augustus (31 a.C. to 14 p.C.) first discusses an organized medical service, but in a manner to indicate that it represented nothing new, and we read *inter alia* that there were so many wounded and sick that the problem of finding shelter and care for them prevented pursuit of the vanquished enemy.

Livy tells us that after the battle near Luceria (548) the soldiers were completely demoralized, because they had to pass an entire night awake, listening to the cries of the wounded and the groans of the dying. We see, therefore, that long before the dawn of modern civilization strategists knew that a well-functioning medical service sustains morale, or rather prevents one reason for demoralization.

That the lessons of history have not always been taken to heart a few confirmatory incidents may be mentioned:

Magister Laukhard, in his autobiography, tells of the most incredible conditions of misery and despair in the Prusso-Austrian lazarets in 1793, due to callousness and neglect on the part of the under-sanitary personnel during the campaign against the new French Republic, which completely demoralized the "eight-penny soldiers." Humane officers, who denounced graft and cruelty and neglect of their enlisted personnel who were "left to die like dogs in their own excrements due to dysentery," died of broken hearts when they discovered the machinations of the men high up in authority. On paper the King of Prussia did something for his hireling army by allowing extra moneys for the care of the sick and wounded; but the academically trained physicians, the real medical officers, hardly visited the hospitals even perfunctorily, and devoted themselves to all sorts of pleasures. Incredible as this sounds, Laukhard's books contain internal evidences of incontestable truth! One higher commander could have worked wonders, but none seemed to care. As a result, desertions were very common, many Prussian and Austrian soldiers deliberately going over to the French, and even fighting on the side of the Republicans, who accorded them decent treatment.

The most striking example of the result of medical unpreparedness for war and of the evil effects of the failure to recognize the military character of the medical service is furnished by the Crimean war (1854-56). Major (now Lieutenant-Colonel) Fielding H. Garrison contributes in the October, 1917, issue of *THE MILITARY SURGEON* a masterly study of this campaign under the heading, "The Statistical Lessons of the Crimean War," which should be read with care by all interested in the welfare of our Army. Garrison makes this significant remark: "London

and Paris burned the wires with strange administrative orders, which hampered their respective armies and incidentally blighted the French medical service very materially. . . . The lessons of earlier campaigns, particularly the recorded experiences and recommendations of army surgeons, were cast aside and disregarded, a common enough procedure at all times and places." Sir Thomas Longmore ("The Sanitary Contrasts of the British and French Armies during the Crimean War," London, 1883) does not mince words in criticising the unpreparedness of the British Army. Until the siege of Sebastopol, authority was in the hands of line officers; there was no surgeon-general, and a wholly incomplete and ineffective field hospitalization.

Regarding the French, Garrison maintains that "the havoc made by scurvy and typhus was due to the way in which the French medical officers in the field were overborne and their advice disregarded by the intendance." The conditions became so desperate that the French Government was forced to terminate hostilities and withdraw its forces before the ultimate aims of the campaign were accomplished. (Garrison.)

The Russo-Japanese War in Manchuria (1904-05) has special interest in that it was fought at a period when military medicine and surgery had reached a high plane of development, with the experiences gained during the Civil War, the Franco-Prussian War, and even our Spanish War (Cuba) still fresh in the minds of the General Staff of the Russian Army. But the Russian Government still saw fit to place the tactical responsibility for the frontal medical service in the hands of military laymen.

The literature on this war is voluminous, and one hardly knows what particular official report to utilize, since all seem agreed on the fallacy of such a system. We are told of soldiers on the firing line leaving their positions under the pretense of carrying or just "accompanying" wounded to the rear; we hear of ambulance companies standing idle for hours while a short distance from their positions of rest hundreds are wounded and left without transportation; we hear, too, of field or divisional hospitals being moved about without any particular aim, while others remain idle and useless for prolonged periods; of sanitary trains being sent out without any heating appliances during a severe Siberian winter, resulting in many unnecessary deaths. As one writer puts it, the chiefs of the medical service had only one conception of their duties, namely, to be able to telegraph to the czar that all wounded have been promptly evacuated, irrespective of the cost in human lives. Add to this the breaking down of the supply system, and one cannot but concede that the Russian Government had deliberately invited demoralization and defeat.

On the Japanese side, the medical department could boast of full autonomy, and, as Colonel Charles Lynch of our Medical Corps so aptly reports to the War Department, "This is quite in accordance with the spirit of Japanese institutions, which are remarkably free from petty interference in details, only demanding results. This throwing of the responsibility for the entire care of the sick and wounded on one department, so far as might be in an army, was attended with excellent results. . . . While the organization of the Medical Department of the Japanese Army was excellent, the administration was even better; in fact, the administrative skill of the medical officers was of so high an order that it is not too much to say that it would be difficult in any army to find any department better administered than the Medical Department of the Japanese. . . . The Medical Department of every army must, of course, be only part of the whole, and while that of the Japanese performed its duties well, its success must be ascribed in part to the line and to the other departments, which aided it by all means in their power, with no personal or departmental jealousies, their only anxiety being for the success of the army. . . ."

The Balkan War (1912-13), the last fought before the World War, presents certain lessons, especially as far as concerns the Bulgarian and Turkish armies. In both the medical services were inadequate numerically. Bulgaria, however, realizing the importance of the campaign in Thrace, made at least some preparations for sanitation and the care of the wounded, and while the service left much to be desired, due to lack of material means, the spirit was good. One cannot help but admire the women of the nation who volunteered for any kind of service that might alleviate the havoc brought on by a merciless campaign in a difficult terrain and under bad atmospheric conditions.

Turkey, which had had instruction and warnings by several noted German surgeons, was as negligent in its sanitary arrangements as it was in its mobilization. The cholera epidemic, which raged for some time in the army and the civil population, decimating both, and which persisted until the Ottoman forces organized along the Tshatalcha line as a last defense of the Turkish capital, compelled the Turkish Minister of War to sue for an armistice, which was refused by the Bulgarian and allied nations, though they themselves suffered considerably from the epidemic.

While the cholera epidemic was, of course, not the sole cause of the Turkish defeat, it served completely to destroy the morale of the notoriously stoic Mussulmen, especially the Rediffs, already partly demoralized through defective leadership.

VII

THESES

1. The Medical Department of an organized military force has the primary mission to assist in winning wars.

2. The Medical Department accomplishes its principal mission through facilitating the development of morale of the fighting forces before campaign and through sustaining their morale during campaign.

3. The Medical Department is an integral part of the organized military forces, constituting a technical and strictly military branch of the Army and Navy.



DISEASES DESCRIBED BY MEDICAL MEN WHO SUFFERED WITH THEM¹

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NOTE—We publish the following concurrently with its appearance in *The London Lancet* by permission of Sir Humphrey Rolleston and the *Lancet* itself. Sir Humphrey Rolleston is an Honorary Member of our Association and anything from his pen will command the interests of our readers.—THE EDITOR.

IN THE selection of a subject in response to your complimentary invitation it was obviously unwise to encroach on those aspects of medicine that your teachers deal with so much more advantageously, and I have accordingly chosen one on which it is to be hoped that none of them—though here I am not on safe ground—are personally competent to speak with real authority—namely, diseases described by medical men suffering from them. Stephen Paget, in his delightful *Confessio Medici*, says: “You cannot be a perfect doctor till you have been a patient: you cannot be a perfect surgeon till you have enjoyed” (and he goes on to emphasize his choice of this verb) “in your own person some surgical experience.” According to this line of reasoning the perfect author should be a man of many joys (or sorrows?); and though I wish them well it is not this kind of joy that your teachers deserve.

VICTIMS TO THEIR SPECIALTY

Although the title, “Diseases Described by Medical Men who have Suffered from Them,” excludes the examples of medical men who have paid particular attention to a disease and eventually fallen a victim to their specialty, a brief reference to this subject may perhaps be made. It has been said, possibly inspired by the attractive speculation that auto-suggestion is at work, that this sequence is common, and Sir William Hale-White tells me that Sir Samuel Wilks, who was a doctors’ doctor, was firmly convinced of this association. On the other hand, this coincidence is so striking that there is a risk of exaggerating its frequency. Writers of complete text-books would of necessity swell this category and must therefore be disqualified. For example, Nothnagel died of what has from the toll it levies been called the doctors’ disease—namely, angina pectoris—on which he was a recognized authority; but he was also the editor of a voluminous encyclopaedia of medicine, and wrote on a number of other subjects. As examples of authors unconscious that the future would add a grim personal interest

¹ A paper read before the Medical Society of St. Mary's Hospital Medical Society on February 23, 1921.

to their favorite professional subjects the following may be quoted; Laennec, who died from pulmonary tuberculosis; Sir William Gull, who, with H. G. Sutton, described arterio-capillary fibrosis, from cerebral hemorrhage; Mikulicz from carcinoma of the stomach; S. O. Habershon, the author of a book on "Diseases of the Stomach," of simple gastric ulcer; G. R. Fowler, an American surgeon, author of a "Treatise on the Appendix," and originator of the Fowler position, of appendicitis; Corvisart and Lancisi of heart disease.² The late Sir A. B. Garrod, who wrote in 1876 that, unlike Sydenham, he could not from personal experience describe the sensations of gout, became its victim, when 70 years of age, so his son the present regius professor of medicine at Oxford tells me. Trousseau, whose clinical lectures covered nearly the whole field of medicine, pointed out that if thrombosis occurred in a case of gastric disease, carcinoma might safely be diagnosed; when himself ill he was visited on January 1, 1867, by his former pupil Peter, who, when thus calling to express good wishes for the New Year, had the painful experience of hearing his teacher say: "It is all up with me, the appearance of a patch of phlebitis last night leaves no loophole for doubt as to the nature of my illness." Trousseau was right in applying his diagnostic deduction to his own case; he lingered on for six months, dying at the age of 66 years on June 23, 1867.

OCCUPATIONAL DISEASES AMONG MEDICAL MEN

Attention may be called to examples of what might be called occupational diseases among medical men; medical officers specially interested in infectious diseases, including tuberculosis, syphilis, and tropical affections, on which they may have written, are naturally liable to contract these diseases, and radiologists have suffered much in the past, especially from carcinoma. Those who have worked at the laboratory aspects of infections may fall victims to these diseases, and many examples might be given. Probably the best known are those cases in which the accident has rapidly proved fatal and so do not come under the category of those who have described the disease from personal experience. But of these martyrs to medical research the names of a few may be mentioned:—enteric fever: Allen MacFadyen, H. J. Tylden, L. Jenner; yellow fever: W. Myers; Rocky Mountain fever: T. B. McClintie; plague: Müller; spirillum fever: J. E. Dutton; glanders: J. H. Wells (1909). Another group contains those who have deliberately inoculated themselves with infective or probably infective material; thus J. W. Lazear allowed mosquitoes to bite him and by his fatal illness

²For an interesting paper on "Diseases of Great Physicians of the Past" see William Pepper (Tertius), *Medical Library and Historical Jour.*, December, 1907; abstract in *New York Med. Jour.*, 1908, lxxxvii., 231.

proved the transmission of yellow fever; the late Dr. P. T. Manson allowed infected mosquitoes to bite him, and by thus contracting malaria proved that they transmitted the disease; his death, however, was due to an independent accident; the late Dr. R. Cory, of St. Thomas' Hospital, frequently vaccinated himself with vaccine lymph from syphilitic infants and eventually became infected; and John Hunter³ inoculated himself with pus from a case of gonorrhoea but developed syphilis, and was thus led to believe in the unity of venereal disease; it is, indeed, probable that his dramatic death from angina pectoris was due to syphilitic aortitis.

GREAT NAMES CONNECTED WITH SPECIAL DISEASES

Bright, Addison, and Hodgkin—the great triumvirate of Guy's Hospital—did not suffer or die from the diseases so inseparably connected with their names. Bright died at the age of 69 after four days' illness attended with haematemesis, and the necropsy revealed pure aortic stenosis with healthy kidneys. He was known to have some cardiac affection, but it is said that inquisitive attempts to find out its exact nature were always frustrated by him; at consultations between several eminent physicians, including Bright, the problem was sometimes attacked by proposing to compare the patient's pulse with that of a presumably healthy man (Bright); but the erudite touch of the inquiring colleague was always skillfully evaded. About Addison's end kindly reticence drew a veil at the time of his death, but it appears that he became insane and jumped out of a window at Brighton when 67 years old. Hodgkin, who was pathologist, but never on the medical staff of Guy's Hospital, died of dysentery at Jaffa at the age of 68. Dr. Joseph Ignatius Guillotin (1738–1814), who was a zealous advocate of vaccination and the founder of a short-lived Académie de Médecine in Paris, did not, as poetic justice might well demand, have his head removed by the instrument to which his name is attached.

DISEASES DESCRIBED BY MEDICAL SUFFERERS

When giving descriptions of diseases from which they may happen to have had personal experience some writers record their own sensations under a modest periphrasis such as "a man known to us whose heart stands work well in all other respects but in whom intermittence of the heart may occur for many days if he remain for an hour or two with many smokers. He dare not sit in a close smoking room or in a smoking carriage." Or "a case is known to the writer in which the patient suffered from a severe attack 18 years from the onset of the

³ Works of John Hunter with Notes, edited by J. F. Palmer, 1835, vol. ii, pp. 146, 417.

disorder (bilharziasis), which had been in abeyance for some years." The late L. G. Guthrie,⁴ apropos of ophthalmic migraine, wrote: "In one case known to the writer permanent paralysis of the ocular sympathetic appears to have been the result of repeated migraine."

The accurate observations of medical men on their own diseases, in spite of the quip that "he has a fool for his patient," are interesting human documents, and may add to our knowledge of the earliest indications of disease. Such personal descriptions are of special value from the point of view of the subjective manifestations or symptoms as opposed to physical signs. The physical signs are best observed by the onlooker and may escape the attention of the patient. Thus L. P. Mark, for some 15 or 20 years, each day when he looked into the glass to brush his hair or to shave had a typical acromegalic literally staring him in the face,⁵ as had been clear to his professional friends for years, and when 49 was spotted in a crowd by Professor Pierre Marie, who originally described the disease, while in London for a medical entente cordiale. His graphic account of his sensations and sufferings, on the other hand, give much fresh information, especially as regards the occurrence of exacerbations in the disease, or of periods which he calls the acromegalic state during which the symptoms, like the physical signs, are accentuated; these symptoms varied from malaise to complete incapacity to do anything and mental depression.

Julius Thomsen's⁶ description (1876) of the disease of the muscles (myotonia congenita) hereditary in his family first drew attention to this disease. This is the best, if not the only, example of a disease first brought to our knowledge by a sufferer, for it is not certain that John Bostock gave the first account of hay fever. Otherwise the nearest approach to such an original document is probably that by Dr. R. Druitt,⁷ who gave a full description, especially as regards the early symptoms, of paroxysmal haemoglobinuria under the title Paroxysmal Haematuria in 1873, a year after the disease had compelled him to retire from active practice. But as far back as 1831 Elliotson⁸ briefly referred to a case as connected with malaria, and in 1865, at the same meeting (on May 9th) of the Royal Medico-Chirurgical Society, G. Harley⁹ and W. H. Dickinson¹⁰ read papers on intermittent haematuria;

⁴ Guthrie, L. G.: *The Diseases of Children* (Garrod, Batten and Thursfield). Vide also *Clinical Journal*, August 5, 1896.

⁵ Mark, L.: *Acromegaly, a Personal Experience*. Baillière, Tindall, and Cox. 1912.

⁶ Thomsen, J. (of Kappeln, Schleswig): *Tonische Krämpfe (Ataxia Muscularis?)*, *Arch. f. Psychiat.*, Berlin, 1876, vi., 702.

⁷ Druitt, R.: *Med. Times and Gaz.*, 1873, i., 408, 461.

⁸ Elliotson: *THE LANCET*, 1832, p. 300.

⁹ Harley, G.: *Med. Chir. Trans.*, 1865, xlviii, 161

¹⁰ Dickinson, W. H.: *Ibid.*, 1865, xlviii, 175.

Harley recognized that the red blood corpuscles were dissolved, but he believed that the underlying factor was hepatic derangement, apparently on account of the accompanying icteric tint; Dickinson, on the other hand, more nearly approached our present views in saying that we must be content to regard the disorder as something *sui generis* and the blood itself as the seat of the primary change. Druitt's symptoms began when he was 52, six years before his account of the disease was published, and lasted until his death in 1883 at the age of 68; he was the author of a once well-known handbook, "The Surgeon's Vade Mecum," which went through 11 editions.

MIGRAINE, ASTHMA, AND GOUT

The diseases most often described by medical patients are naturally those of a chronic character, and especially those with intervals of fair health between acute attacks of paroxysms, such as migraine, asthma, and gout.

Migraine, or sick headache, has the distinction of having been portrayed by more distinguished victims than has any other disease, even gout, and it is noteworthy that some of the most careful accounts of the visual phenomena have been given, not by medical men, but by the leading lights of pure science, especially astronomers, such as Sir G. Airy, Sir John Herschell, Sir D. Brewster, and Sir C. Wheatstone. In 1886 Hilton Fagge wrote: "I do not know of any other malady which within the present (XIXth) century has been the subject of two papers admitted into the *Philosophical Transactions*, as well as of communications to the *Philosophical Magazine* and other scientific publications in this country and abroad." It may therefore be said of it, as Sydenham feelingly remarked of gout, that it attacks more wise men than fools. Among well-known medical contributors to the literature of the disease are W. H. Wollaston, interim President of the Royal Society in 1820, who, however, threw up the profession in disgust when he was rejected as a candidate for the post of physician to St. George's Hospital in 1800; John Fothergill, the Quaker physician and philanthropist, of whom Benjamin Franklin said, "I can hardly conceive that a better man has ever existed"; Caleb Hillier Parry, the "distinguished old Bath physician"; Dr. E. Liveing, who wrote a classic on megrim (1873), Sir Samuel Wilks and Dr. Alexander Haig, a life-long sufferer until he dieted himself. Dr. Hubert Airy and Sir James Mackenzie have published colored representations of their own spectra. Mackenzie mentions that the scintillations once came on when he was about to operate on a case of appendicitis, but in the concentrated attention given to the operation they disappeared, only to return about a quarter of an hour after the operation was finished.

Asthma and hay fever, being examples of toxic idiosyncrasies on which Dr. John Freeman has thrown the light of the laboratory, may be considered together. In 1819 John Bostock,¹¹ later Vice-President of the Royal Society, described his own case as a "periodic affection of the eyes and chest," and nine years later, now under the new name "*Catarrhus aestivus*, or summer catarrh," was able to collect 28 examples of a similar nature, but the only reference to a previous description of the disease that he could find was one by Heberden. But asthma, which it must be admitted is a rather vague term, as it may include many causes of dyspnoea, was previously well known. Sir John Floyer described his own case in his "*Treatise on Asthma*" (1698), and in Hutchinson's "*Biographia Medica*" (1799) it is stated that John Arbuthnot's "*Essay on the Effects of Air on Human Bodies*" (1733) was apparently the outcome of consideration of his own case, "an asthma which gradually increasing with his years became shortly after unmanageable and incurable."

Arbuthnot, in his political skit, "*The History of John Bull*," originated this familiar personification of the English nation: "Bull in the main was an honest, plain-dealing fellow, choleric, bold, and of a very inconstant nature." It may be added that in one of his lighter touches the late Sir Victor Horsley described our three British institutions—John Bull, Father Christmas, and King Henry VIII.—as examples of fatty degeneration due to chronic alcoholism.

Another instance, certainly interesting on account of the correspondents, is to be found in a letter written from York on June 3, 1795, by Dr. Thomas Fowler (1736–1801), whose name is so familiar in Fowler's solution (*liquor arsenicalis*) to Dr. William Withering, of Birmingham, the introducer of *digitalis*, detailing his symptoms as those of *angina pectoris* and asking for advice; Dr. Withering endorsed the letter with his opinion that the disorder was spasmodic asthma. Turning now to later authorities, Hyde Salter wrote a treatise on asthma in 1859; C. H. Blackley, in his monograph (1873) on *Catarrhus Aestivus* or Hay Fever, refers to T. Wilkinson King, G. T. Gream, and W. P. Kirkman as fellow sufferers, and Trousseau¹² described his own experience; W. E. Steavenson in his published thesis for the M.B. at the University of Cambridge (1879), says, "I have never been prevented by an attack of asthma from going in for or completing any examination; but when completed and the strain on my mind relieved, it has always been followed the succeeding night and day by a severe attack."

Many famous medical men have suffered from *gout*, and some of them have made their experiences public. Thomas Sydenham (1624–

¹¹ Bostock, J.: *Med.-Chir. Trans.*, 1819, x, 161, and 1828, xiv, 437.

¹² Trousseau: *Clinical Lectures*, p. 625, vol. i, 1868, New Sydenham Soc.

1689),¹² the English Hippocrates, was a chronic victim of gout, and towards the end of his life, when suffering from renal calculus and haematuria, brought out his *Tractatus de Podagra et Hydropse* (1685). Benjamin Franklin (1706–1790) was also plagued with gout and vesical calculus and wrote a curious pamphlet, “A Dialogue between Franklin and the Gout.” Dr. William Stukeley (1687–1765), not only a distinguished physician, but so eminent in archaeology and druidical history that his friends familiarly spoke of him as the “Arch-Druid of this age,” became so overpowered by the fatigues of his profession and repeated attacks of gout that he turned his thoughts to the church and was appointed to the living of All Saints, Stamford, in 1730, where he was treated by Dr. Rogers with his *oleum arthriticum*. The successful result of this external application induced Stukeley to publish “A Treatise on the Cause and Cure of Gout, with a New Rationale” (1734). It should, however, be noted that in addition to rubbing on the oil Stukeley adopted a proper regimen and left off the use of fermented liquors. A famous example of a physician recounting his own ailments is that of George Cheyne, who described his obesity, neurasthenia, and hyperchlorhydria and his cure in “The English Malady” (1733). In “An Essay of the True Nature and Due Method of Treating the Gout” (1720) he also drew on his own experience.

The late Sir Robert M. Simon suffered from *Ménière's disease*, and a graphic description of his symptoms from his own hand was published posthumously.¹³

Sir George Murray Humphrey, of Cambridge, had *phlebitis* on three occasions—in 1843 after right-sided pleurisy, in 1846 after typhoid fever, and again in 1851 after pleurisy. He laughed at those who kindly told him that he would die, and wrote his M.D. thesis on “The Formation of Clots in the Venous System during Life,”¹⁴ recording his own case: “My attention was first called to it by its occurrence in a member of the medical profession, a delicate man.”

OTHER DISEASES, INFECTIONS, AND ACCIDENTS

Alimentary canal.—Merycism or rumination has been described by several medical sufferers: Näcke, Combay, Blanchard, and Halliday.¹⁵ J. H. Keay,¹⁶ from frequent personal experience, insisted that the initial pain of *biliary colic*, presumably due to the entrance of a stone into the cystic duct, is felt in the back and not, as is commonly stated, in the right hypochondrium or epigastrium, and Dr. Kraus, of Carlsbad,

¹² Vide *Brit. Med. Jour.*, 1915, i, 53, 282.

¹³ Vide *Brit. Med. Jour.*, 1859, 582.

¹⁴ Vide Brockbank, E. M.: *Brit. Med. Jour.*, 1907, i, 421.

¹⁵ Keay, J. H.: *Medical Treatment of Gallstones*, p. 75, 1902.

expressed the same opinion on similar grounds. Professor Lewellys Barker,¹⁷ in an article on the diagnosis of gall-bladder disease, mentions that when 8 years old he had enteric fever, and that 35 years later four gall-stones giving cultures of *B. typhosus* were removed from his gall-bladder. Dr. E. A. Cockayne¹⁸ detailed his own experience of catarrhal jaundice.

Cardiac and renal disease.—The late Sir W. T. Gairdner, who wrote much on the cardio-vascular system, gave an account¹⁹ of his own symptoms in Stokes-Adams's disease. W. C. Wells (1757–1817), the famous author of "The Essay on Dew," suffered from dropsy and cardiac asthma; he wrote on scarlatinal and other forms of dropsy, pointed out that the urine contained albumin in scarlatinal and cutaneous dropsy, but not in primary hydrothorax or ascites. He noted that in some of his cases the kidneys were diseased, and thus prepared the way for Bright's generalization; he anticipated Blackall, who subsequently elaborated the observations on the presence of albumin in the urine. James Jurin (1684–1750), the first physician to Guy's Hospital (1725–1732), suffered severely from renal calculus, and described his painful experience in his "Account of the Effects of Soap-Lye, taken Internally, for the Stone," published in 1740.

Infections.—Murchison, who had typhus twice, graphically described his own sensations and delusions during the delirium of the disease, and quoted similar personal accounts by Hildenbrand and Gueneau de Mussey. Benjamin Rush, "the American Sydenham," after advocating bleeding and purgation with good results in yellow fever, contracted the disease, had his own treatment, and recovered. Surgeon-General G. M. Sternberg, who investigated many outbreaks of yellow fever, and wrote much, especially about the aetiology and prevention of the disease, had an attack after the third outbreak and was as energetic as ever in advocating measures for its prophylaxis. Sir James Paget in his account of his illness contracted from examination of a patient dead of pyaemia remarked, "Sir William Lawrence used to say that he had not known anyone to recover on whose case more than seven had been consulted. Our art has improved. I had the happiness of being attended by ten." In recording his own experiences as a case of staphylococcic infection, Sir Lauder Brunton²⁰ noted that the pain was worse after meals, when hydrochloric acid was being absorbed from the stomach, and that relief followed the ingestion of sodium bicarbonate and its local application to the pustule; he referred to the dimin-

¹⁷ Barker, L.: Jour. Amer. Med. Assoc., Chicago, 1920, lxxxv, 1105.

¹⁸ Cockayne: Quart. Jour. Med., Oxford, 1912, 13, vi, 3.

¹⁹ Vide "Life of Sir W. T. Gairdner," by G. A. Gibson, M.D., pp. 133–152, 1912.

²⁰ Brunton, L.: St. Bart's Hosp. Rep., 1903, xxxix, 227.

ished alkalinity of the blood, but did not use the term acidosis, which, though invented, was not then in popular parlance. Alexander Ramsay (1754–1824) who, according to some, was a compound of personal deformity, immense learning, uncontrollable temper, and inordinate vanity, wrote "Personal Experiences from the Bite of a Rattle-snake."²¹

Tuberculosis has naturally attracted its medical victims to its study, and has recently been responsible for a number of medical officers to sanatoriums. Sir Andrew Clark, when young, was gravely ill with tuberculosis, and when given an appointment at the London Hospital in 1853 was not thought likely to survive a year; no doubt his own condition led him to undertake inoculation experiments with tuberculous material, a subject to which Villemin's researches were then (1865) calling much attention; but his work was interrupted by an attack of haemoptysis. He also did much to establish the existence of a non-tuberculous destructive disease of the lung under the name of fibroid phthisis or, as it is now called, chronic (interstitial) pneumonia. E. L. Trudeau developed pulmonary tuberculosis in 1871 and was the pioneer of the open-air treatment of the disease at his sanatorium at Lake Saranac, in the Adirondacks, where R. L. Stevenson was for a time, and where, according to E. V. Lucas,²² simplified spelling is in vogue and "that most august and mysterious of the functionaries of life, the physician, is able to watch his divinity dwindle and his dignity disappear under the style Fizisn." Dr. James Henry Bennet went to Mentone for disease of the lungs and was the chief agent in establishing Mentone as a health resort; he wrote a book on "The Treatment of Pulmonary Consumption by Hygiene, Climate, and Medicine."

Rupture of his tendo Achillis about 1762 led Alexander Monro, primus (1697–1767) of Edinburgh, to record his accident; and John Hunter's similar experience while dancing in 1768 inspired him to investigate experimentally the healing of tendons in dogs. Percivall Pott's fracture, due to a fall from his horse in 1756, has kept his name in perpetual recollection.

CONCLUSION

Lastly, most of the writers on old age and its infirmities, such as Cornaro, Sir Anthony Carlisle, Charcot, Sir George Humphry, Sir Hermann Weber, and Dr. R. Saundby, have been approaching the sere and yellow. A few dying physicians have recorded their experience until the pen slipped from their fingers, and it is difficult to find a more comforting last word than that of the great William Hunter, "If I had strength enough to hold a pen, I would write how easy and pleasant a thing it is to die."

²¹ American Medical Biographies (Kelly and Burrage), p. 951, 1920.

²² "From an American Note-book," Times, Sept. 24, 1920.

A DEPARTMENT OF EPIDEMIOLOGY FOR ARMY DIVISIONS

BY LIEUTENANT-COLONEL O. G. BROWN

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AT THE BEGINNING of the World War few problems confronting the Army Medical Department were more pressing or more difficult of solution than that of the control of infectious diseases in army camps.

The concentration of large bodies of young men, from all sections of the country, in hastily improvised concentration camps, under war conditions, made the rapid spread of communicable diseases among them inevitable. Experienced Epidemiologists were hard to obtain; how hard could probably have been demonstrated in no other way than by the exactions of war. The services of a few health officers from large cities and of a few graduates and teachers from recently established schools of public health were available, but the supply of officers of this caliber was extremely limited and was soon exhausted. Most of the epidemiological work had to be done by the already over-taxed Division Surgeon, assisted in emergencies by the Bureau of Laboratories.

The War Department is now going through a stock-taking and reorganization process, as a result of the lessons of the war. The lessons learned in Preventive Medicine have led to a greatly increased development of epidemiological work in the Medical Department.

Strictly speaking, Epidemiology is the science of epidemic diseases, but in its broader application and as the term is now generally understood it is not limited to epidemic or even to contagious diseases but is made to include the study of morbidity from all causes. It is in effect the application of the principles of the practice of medicine to communities rather than to individuals. It has been described as the connecting link between clinical and experimental medicine on the one hand and vital statistics on the other—experimental medicine dealing with the development of medical science and vital statistics serving as a sort of clinical thermometer for the registering of the various changes and reactions of populations.

Epidemiology is essentially a new subject. Parts of it, of course, are as old as the history of medicine, but its modern development is based largely upon comparatively recent studies in bacteriology and immunology.

A few medical schools are now teaching Preventive Medicine as a specialty, and the scattered literature pertaining to it is being assembled.

It may be that future applicants for commission in the Army Medical Corps will be trained epidemiologists, but, for the present at least, it is necessary to study this subject within the Army.

ORGANIZATION

For the purpose of this paper the division, in time of peace, is taken as a basis of study, as the division is the principal large administrative unit of the Army, and peace conditions are more favorable for study and experiment.

According to the proposed new tables of organization the division will consist of about 11,500 men in time of peace, and about 20,000 in time of war.

The Division Surgeon is the chief medical officer. His principal assistants are the Assistant Division Surgeon, the Sanitary Inspector, and the Laboratory Officer. The Dental Surgeon and the Veterinary Surgeon, although belonging to separate corps, are closely connected with his office. At large camps the hospital and attached laboratory may or may not be divisional units, but they are usually placed under the control of the Division Surgeon.

The duties of a Division Surgeon are in part analogous to those of a city health officer. In addition he is Commanding Officer of a medical regiment and is a member of the staff of the Division Commander.

The Assistant Division Surgeon is first assistant to the Division Surgeon. He generally has charge of matters of administrative routine.

The Sanitary Inspector makes regular inspections of barracks, quarters, and grounds. He examines into the quality of the food and water supply, clothing, disposal of wastes, and the sanitary surroundings of the soldier and camp in general. He reports to the Division Surgeon. It is understood that it is now intended to make Epidemiology an established department of the work of the Sanitary Inspector.

The Laboratory Officer has charge of the Laboratory Section of the Medical Regiment. He is equipped with complete portable equipment and is given ready access to the large army laboratories.

The epidemiological work is now scattered throughout several different offices and departments, the Division Surgeon's office, the Sanitary Inspector's office, the hospital and laboratory. The proposal to make it a part of the Sanitary Inspection Department is a step in the right direction in that it will enable the epidemiological work to be assembled in one office and under one head, but if the work of Sanitary Inspection and Epidemiology is to be combined it would seem more logical and would place the emphasis more nearly where it belongs to make the work of Sanitary Inspection a part of the Department of Epidemiology.

A DEPARTMENT OF EPIDEMIOLOGY

The importance to the Army of the study and control of infectious diseases would seem to justify the assignment to each division of a Division Epidemiologist who would devote his entire attention to this work. If an additional staff officer cannot be placed on the staff of the Division Surgeon the duties ordinarily performed by the Assistant Division Surgeon could possibly be assigned to a junior officer.

Two main requirements must be met in the development of a Department of Epidemiology: First, the training of the Epidemiologist; and, second, the outlining of the work to be performed.

The main requirements of the Epidemiologist are:

1. General knowledge of clinical medicine.
2. A working knowledge of statistical methods.
3. Knowledge of the basic principles of administration.

The work to be performed by the department could be summarized as follows:

1. The prompt recognition of outbreaks of disease.
2. The limitation of the spread of infections.
3. The recording and analytical study of disease incidence.

In the training of the Epidemiologist, Statistics and Administration will need to be taught as almost new subjects.

The average medical officer, on entering the service, has received instruction in only the first of the required subjects. He has a knowledge of clinical medicine, but knows little or nothing of statistics and has probably given little thought to the business of handling men, or to other problems of administration. At the Army Medical School he is given intensive training in bacteriology and allied laboratory subjects, special instruction in selected branches of medicine and surgery, and is taught something of military administration, particularly in regard to regulations, drill, etc. His training is such as to fit him for the all-round duties of a medical officer. Opportunities for specialization are usually provided later. Without a basic knowledge of statistics and training in executive methods he cannot properly apply his knowledge of medicine to the study and treatment of populations.

STATISTICS

According to the classical definitions of Yule:

"By statistics we mean quantitative data affected to a marked extent by a multiplicity of causes.

"By statistical methods we mean methods specially adapted to the elucidation of quantitative data affected by a multiplicity of causes.

"By theory of statistics we mean the exposition of statistical methods.

"The insertion in the first definition of some such words as 'to a

marked extent' is necessary, since the term 'statistics' is not usually applied to data like those of the physicist, which are affected only by a relatively small residuum of disturbing causes. . . . In the problem of molecular physics, . . . multiplicity of causes is the essence of the case. The motion of an atom or a molecule in the middle of a swarm is dependent upon that of every other atom or molecule in the swarm."

The complete theory of statistics is a difficult and complicated science, the complete comprehension and enjoyment of which is reserved for mathematicians. Only the elements of the subject are required, however, in public health work, and these are within the reach of almost any medical officer. The attempt to master the higher branches would in most cases be useless and would lead only to confusion and discouragement. A superficial knowledge, even of the rudiments, on the other hand would be worse than useless, as it would lead the student to false assumptions and wrong conclusions.

In the words of George C. Whipple: "There are some statisticians who are statisticians and there are some statisticians who are mathematicians. There are theories of statistics which comprise a very considerable part of mathematics. Volumes have been written on the Calculus of Probabilities, on Least Squares, on Variation. On the other hand, many of the statistical processes are extremely simple and do not get beyond the bounds of ordinary arithmetic. The simple processes have a wide general use; the more elaborate processes have their place but are not commonly applicable or necessary. . . . Even at the present time it is safe to say that the most successful health officers are good statisticians, although it does not follow that all good statisticians are successful health officers."

Statistics is full of pitfalls for the unwary. The popular saying, "Anything can be proved by statistics," is probably due to the many grotesque meanings which have been read into columns of figures. The figures themselves may mean anything or nothing; their value lies in their interpretation and in the proper visualization of the facts for which they stand. The Epidemiologist must have sufficient knowledge of statistical methods to collect data with discrimination as to its relevancy and importance and to assemble it in a clear, comprehensive, and reasonably concise manner.

While the necessary proficiency in this work is not especially difficult of attainment, it is not to be acquired without well-directed study.

ADMINISTRATION

Knowledge of the basic principles of Administration is necessary for the practical application of any of the principles of Epidemiology.

Theoretical knowledge of the modes of spread of diseases and statistical studies of their effects upon populations would be of little use in prevention if communities could not be made to accept this knowledge or at least conform to its teachings.

The practical applications of Preventive Medicine are not always easy. They will not always be viewed with favor by those having the power of enforcement. They must be often irksome to the individual concerned, and attempted evasions are to be expected. The activities of a corps of assistants must often be supervised and coordinated. These and a score of routine problems must be met by the Epidemiologist. He must know when to insist, when to persuade, when to bully, and when to yield; and he must know how to do each of these things when occasion demands.

The belief is not uncommon that executive ability is inborn; that, like certain of the arts, it is a sort of gift of nature which some men receive and others do not and cannot acquire. The success of one administrative officer and the failure of another, working under similar conditions and with similar materials, is too often attributed to the difference in their "natural qualities of leadership." It would seem more logical to liken administration to mathematics, which some have learned and others have not, and to attribute the successes and failures more to the difference in the methods and systems that the executive officers employ.

Executive work consists chiefly in the handling of men; those in higher authority incidentally, but more particularly those who are subordinate. The executive officer may formulate policies without assistance, but in carrying them out he must secure the industry, enthusiasm, and loyalty of his subordinates.

There are certain fixed laws of administration which are almost infallible; laws of conduct and laws of method, which if systematically followed will yield definite results. A book could be written upon this subject, but, unfortunately, one never has been written; and beginners go on making the same mistakes in the same places where countless others have made them, until they learned better in the school of experience.

EDUCATIONAL FACILITIES

This year, for the first time, it has been possible for a few medical officers to attend the recently established Schools of Hygiene and Public Health, attached to large universities; but the continuance of this privilege is problematical, depending as it does upon changeable congressional legislation. In any event, it will be available for only a limited number of individuals. In view of the increasing importance

and usefulness of Preventive Medicine it is necessary that all medical officers be kept familiar with its newer teachings.

The training in Epidemiology should be commenced as early as possible in the career of the young medical officer. It would be of advantage to establish a course of study in the subject at the Army Medical School, if only to arouse interest at the start. Some of the elements of statistics might be well taught at this time.

The semimonthly *Medico-Military Review*, issued by the Surgeon General's office during the last two years, has served a useful purpose in disseminating knowledge of control of epidemic diseases. It would probably have been more useful if medical officers, generally, could have received greater preliminary training in Epidemiology. The increased distribution of pamphlets and monographs of medical officers, of a character similar to those issued by the Public Health Service, and the stocking of military medical libraries with new literature pertaining to Preventive Medicine would accomplish much toward creating a keener interest and a fuller understanding of this subject.

A greater community of interest and an increased interchange of ideas between military and civilian medical officers is required and is now possible, since military posts are no longer isolated but are, for the most part, now located near large cities.

As laboratory investigations form so important a part of Preventive Medicine it would seem logical to select epidemiologists from among the Bacteriologists, and Division Surgeons from among the Epidemiologists; but as many Bacteriologists have little taste for Administration and as many good administrators are poor Bacteriologists, the Sanitary Inspector should also be considered in line for promotion to Division Surgeon.

DUTIES OF EPIDEMIOLOGICAL DEPARTMENT

It has been said that diagnosis, limitation of spread, and the analytical study of disease incidence constitute the chief duties of the Department of Epidemiology.

The primary diagnoses are usually made by Regimental or Detachment Surgeons, who promptly report the occurrence of notifiable diseases to the Division Surgeon. Many of these diagnoses must be verified by the Epidemiologist. It is of the utmost importance that he be promptly notified of their appearance. As Sir Arthur Newsholme has pointed out, if all the contacts of a first case can be segregated the spread of contagion from that source can often be immediately checked. If the contacts from the second cases can be segregated there is still a chance of preventing further spread, but when the third crop of contact

cases has appeared the outbreak of the disease has assumed the proportions of an epidemic.

Notification of contagious diseases should be upon prescribed forms, in order that the requisite data of epidemiological significance may be obtained in each instance. This is especially important when the cases cannot be seen by the Epidemiologist personally. Upon the conclusion of an important case a second form should be prepared, describing the course, complications, and other developments of interest. (Appendix A.)

It will be impossible in a paper of this scope to discuss in detail the various methods to be used in limiting the spread of individual diseases. These measures are abundantly described in the literature. To secure uniformity of procedure, the distribution of some such general directions as are contained in the Report of the American Public Health Association Committee on Standard Regulations (Reprint No. 436. U. S. Public Health Association, October 12, 1917) would be of benefit.

THREE SPECIAL PROBLEMS

At this time only a few of the general sanitary measures of recent development or which presented problems of interest during the war can be considered, namely: isolation of recruits, increased protection of the milk supply, and improved methods of washing mess-kits.

It has been commonly observed that the arrival of large numbers of recruits is uniformly accompanied by outbreaks of disease in the organizations to which they become attached. In some of the concentration camps in this country, during the war, recruits were kept in separate barracks for a time which would cover the incubation period of the more common acute contagious diseases. The War Department now has under consideration plans to segregate all recruits for fourteen days under the supervision of the Medical Department. It would seem that if such a system were followed many potential epidemics could be strangled at their birth. This period could be used for more detailed examination of recruits and would permit a weeding-out process. A single physical examination at time of enlistment is necessarily imperfect, and may be unreliable in some cases. Discharge of soldiers on account of physical disability detected after enlistment is now an expensive process and is a source of considerable inconvenience to the service. Opportunities would also be afforded for the collection of important data relating to the previous personal history of soldiers.

It is with some hesitation that a venture is made upon the controversial ground of the milk question, but this problem is one of vital importance to the Epidemiologist and is one which does not receive the

attention it deserves at many army camps. The inspections of dairies are liable to be perfunctory, and the required reports upon the quality of the milk are not always based upon laboratory examinations.

Milk-borne epidemics are liable to occur in all communities. When the source is recognized, they are usually comparatively easy of control.

The principal diseases transmitted by milk are diphtheria, scarlet fever, typhoid fever, septic sore throat, and tuberculosis. In pasteurized milk the margin of safety is small. Difference of opinion still exists as to the amount of heat which should be applied. Living tubercle bacilli and other pathogenic organisms have been repeatedly found in commercially pasteurized milk. Recent investigations have shown that the reputed losses in nutritive properties, on boiling, have been greatly exaggerated. Changes in tastes and odors can be considerably reduced by boiling the milk in closed containers and aerating it when cooled. Dr. W. W. Ford and others have shown that milk contains certain spore-bearers which resist boiling, but these have not been shown to be pathogenic in freshly boiled milk. It is the opinion of the writer that all commercial milk intended for domestic use should be boiled, as has long been the custom in Continental Europe, without deleterious effect so far as known. This is stated as a mere matter of personal opinion. The milk problem is an open question. It well merits the close attention of the Epidemiologist.

The problem of washing the mess-kits in a sanitary manner became a very serious one during the war. Kitchen utensils were scarce, and only a few buckets or large cans could be provided per company of 250 men. One soldier would frequently wash his mess-kit in water which had been used by twenty-five or fifty before him. The possibilities of spreading infection, through the saliva, in this manner were enormous. The writer introduced the method of maintaining a receptacle of boiling water over a fire, and required the men to scald their mess-kits in this after the preliminary washing had been given. This practice was later followed throughout the Army. It is suggested that in the future mess-kits be numbered and that after each meal they be washed by the soldier and then turned in to the kitchen, to be boiled for ten minutes. They can then be returned to the soldier, according to their respective numbers. There will be a few occasions, even in the field, when sufficient fire and water cannot be procured for this purpose. At permanent camps dishes should be washed by dish-washing machines.

The recent researches of Colonel Lynch and Lieutenant Colonel Cummings have demonstrated, beyond question, that pathogenic organisms from saliva and fingers can be made to contaminate eating utensils through the dish water.

STUDY OF DISEASE INCIDENCE

In the study of the causation and prevention of disease, both laboratory investigations and mathematical or statistical analyses are employed, illustrating the place of Epidemiology as the connecting link between Experimental Medicine and Statistics.

Through laboratory investigations, bacteria have been isolated, vaccines and antitoxins discovered, the transmission of disease by insects ascertained, and many of the most brilliant achievements of Preventive Medicine have been accomplished. By means of mathematical deductions, based upon observation and experience, on the other hand, the way has been paved for many of the laboratory achievements. It was known that certain diseases were spread by contact before the means of transmission was understood; it had been learned that many intestinal diseases were contracted through drinking water before the causative organisms had been isolated; and it had been demonstrated that malaria could be prevented by the avoidance of marshy districts before it had been discovered that the disease was transmitted by the mosquito.

In epidemiological investigations laboratory methods are used for diagnostic purposes in the examination of foods and water, examination of carriers, and the like. Statistical methods are used chiefly in the study of disease incidence and the evaluation of preventive measures.

It is obvious that the Epidemiologist would require detailed records of all the cases of disease occurring in the Division. Great caution is required in collecting these data. On the one hand, the greatest amount of information obtainable in each instance is desirable, as details which appear trivial in themselves may in their aggregate be of the greatest epidemiological importance. On the other hand, the data required must not be so cumbersome and voluminous as to make their accurate collection impracticable. It would seem practicable to keep a medical history of each man in the Division, of the type of the Individual Health Record now in use in the Navy. Some of the data which would be required in these records is suggested in Appendix B.

The record should be started for each soldier at the time of enlistment. Thereafter, additional entries should be made upon the records upon admission to sick report, upon receiving vaccinations or other special treatments, upon change of station, etc. The record should be kept by the Regimental Surgeon; but it should accompany the soldier upon his transfer to hospital or change of station, as is the case with the descriptive list or service record. A monthly report of entries should be forwarded to the Division Epidemiologist, who should keep himself informed, through the Personnel Adjutant, of all changes in assignments of soldiers.

In the beginning, at least, the record should contain few stereotyped headings, most of the pages being left blank for the entering of current data. It is suggested that the size be about 4 by 8 inches, enabling it to be enclosed without folding in an ordinary official envelope.

By means of these records factors contributing to the causation of disease could be tabulated and classified and the usefulness of preventive measures could be demonstrated. The conditions common to individuals contracting a disease and absent among those who do not contract it could be readily ascertained. The number of persons escaping infections when protected in a certain way could be counted and compared with the number of unprotected persons that so escape, when exposed under the same circumstances.

In determining susceptibility, cases could be divided into groups, according to age, race, nationality, occupation, previous place of residence, previous health, previous attack, presence or absence of artificial immunization, and the countless other factors of epidemiological importance which can be seldom obtained without searching various and multitudinous reports, if they can be obtained at all.

The usefulness of these records as an aid to administrative action could probably be best illustrated by a consideration of some of the epidemiological aspects of an individual disease; Tonsilitis, for example.

Tonsilitis is probably the most prevalent of all the minor diseases of the soldier. It is normally most frequently found among young male adults. During the war it was fifth among the admissions to sick report, and when taken together with bronchitis, laryngitis, and other manifestations of the "common cold," it was third on the list. It arises from a variety of causes, usually being caused by a micro-organism which enters the system on account of lowered resistance, due to chilling, fatigue, the breathing of impure air, etc. One attack predisposes to another and after repeated attacks, chronic inflammation is liable to ensue. In the chronic forms, accumulations in the crypts give rise to local infections and the vague disabilities and illnesses which follow in their train. In investigating recorded instances of this disease, the cause will frequently be found to be common to many cases and, in the company, will invite attention to examination of ventilation of sleeping quarters, the milk supply, etc. Repeated attacks in the same individual would be noted and would suggest detailed examination of the respiratory tract, dental treatment, and, in appropriate cases, tonsillectomy.

The uses to which carefully compiled statistical data could be put are too well known and too numerous to demand great elaboration or defense. The preceding examples are given only to indicate some of the uses which could be made of the data suggested in Appendix B.

There is almost no branch of medicine or sociology with which Epidemiology does not more or less concern itself. In the foregoing pages it has been possible to touch the borders of only the few of them which seemed most important in connection with epidemiological work in the Army. Some of the measures advocated in this paper have already been put into effect or are now under consideration. Increased facilities for epidemiological studies have been made available by the War Department in recent years and far greater developments may be expected in the near future.

The Army Division, in time of peace, affords a unique field for studies in Epidemiology. The entire population is numbered and catalogued. The field is large enough to make the findings significant and small enough to make them accurate. Experiments can be commenced on a small scale and afterwards expanded or discontinued, as their respective merits warrant.

The institution of much of the newer work would entail additional labors for the Medical Department, but it is believed that this would be justified by the results. The investigations would not only be of benefit to the Army, but could be made useful contributions to the science of Preventive Medicine.

SUMMARY

1. There is a need for a Department of Epidemiology for Army Divisions.

2. For the development of additional epidemiological investigations Medical Officers require additional training in Statistics and Administration.

3. The principal duties of the Department would be the prompt recognition of outbreaks of disease, the limitation of spread of infections, and the recording and study of disease incidence.

4. The Epidemiologist should maintain detailed records of disease incidence and individual records of the status of health of each soldier in the Division.

APPENDIX A

Report Cards for Notifiable Diseases

The cards suggested are 5 by 8 inches. Both sides of the cards are used. Form I is for use in reporting the occurrence of individual infections. Form II is for use in reporting the termination of infections.

FORM I

(Obverse)

Disease.....

Name.....Rank..... Organization.....

Age.... Race..... Occupation or duty.....

Date of enlistment..... Date of joining station.....

Date of onset..... Date of isolation.....

Location (house, barracks, tent, hospital, isolation ward, etc.).....

.....

Previous attacks (dates).....

Other cases in company..... Station..... Neighboring town.....

Recent absences on pass or furlough.....

Source of milk supply.....

Suspected source.....

Preventive measures, instituted and contemplated.....

.....

FORM I

(Reverse)

Immediate Contacts

Name	Organization	Nature of contact	Dates of contact	Isolated or not isolated

Contacts with Other Organizations

Name of Organization	Nature of contact and date

FORM II

(Obverse)

Disease.....
Name..... Rank..... Organization.....
Age..... Race..... Occupation or duty.....
Date of enlistment..... Date of joining station.....
Date of onset..... Date of isolation..... Date of discharge.....
Nature and dates of complications.....
.....
Condition on discharge.....
Source of infection.....
.....

FORM II

(Reverse)

Contacts developing the disease (name, date, and circumstances).....
.....
.....
.....
.....
Remarks (control of spread, special treatments, and developments of interest) . .
.....
.....
.....

APPENDIX B

Individual Health Record

GENERAL INSTRUCTIONS

1. The Surgeon of an organization will maintain an Individual Health Record of each officer and enlisted man within that organization.
2. The Health Record will be opened by the Medical Examining Officer; for enlisted men at time of enlistment, and for officers at time of joining the service.
3. Concise descriptions of changes affecting the health of the soldier, such as sickness, injury, vaccinations, special medical treatments, changes of station, etc., will be entered at the time of occurrence. Dental treatments will be entered by the Dental Surgeon. Changes in height, weight, and chest measure will be recorded when observation is afforded.
4. A transcript of changes in Health Records will be transmitted to the Division Surgeon on the last day of each month.

5. Upon the transfer of a soldier to other station or hospital his Health Record will be forwarded with his Service Record.

6. Upon the discharge or death of a soldier the Health Record will be forwarded to the Division Surgeon.

(To be filled in on entering the service)

Name	Number	Race
Rank and Organization	From	To

.....

.....

.....

Date of birth..... Place of birth.....

Previous Places of Residence—

Name of town	Population	From	To
.....
.....
.....

Previous Occupations—

Name of Occupation	Place	From	To
.....
.....
.....

Previous Illnesses—

Disease or Injury	Dates, inclusive
.....
.....
.....

Nationality of father..... Nationality of mother.....

Health of father..... Health of mother.....

Health of brothers..... Health of sisters.....

Known ill-health, past or present, of other relatives—.....

Syphilitic Register—

(History of infection and course, and record of treatments, according to the form now in use in the Army.)

Dental History—

(Form to be supplied by the Dental Surgeon)

Additional Notes—

(About 15 blank pages, 4 by 8 inches)

MALIGNANT TUMORS IN THE UNITED STATES ARMY, 1917-1919¹

By WM. P. FINNEY, JR., M.D.²

AMONG the pathological specimens sent to the Army Medical Museum, Washington, D. C., during the period, May, 1917, to October, 1919, were a number of malignant tumors. As these tumors represented the malignant diseases of such a large body of young men, it seemed to be of some interest to classify them.

Owing to the conditions under which pathological work often had to be done during the war, the diagnosis of these tumors was not always as detailed nor as accurate as would have been possible under more favorable circumstances. In reporting tumors which were found in troops stationed in the United States, only those are listed the diagnosis of which could be verified from the study of tissue received at the Army Medical Museum. The records of the base hospitals were not searched for other possible cases of malignancy. But as tumors were rare in the hospitals and always aroused interest, it is probable that nearly all were sent in to the Museum.

In dealing with the tumors found in the American Expeditionary Forces the same system was not adopted because material from only four of these cases reached the Museum. This list was compiled from the records of the A. E. F. Laboratory Service. In every case reported an autopsy was performed and the tumor was assigned as the cause of death by the officer performing the autopsy. This list very likely includes all the fatal malignant tumors of the A. E. F., but as there is no record of microscopical examination of some of them, there may be some errors in diagnosis. Tumors surgically removed in France without subsequent fatality could not be traced and collected at the time of writing.

In describing the tumors, the terminology conforms as nearly as possible to that used by Ewing in his book "Neoplastic Diseases."

Tumors arising in retired soldiers, civilians attached to the Army, prisoners of war, and nurses are omitted.

¹ From the Laboratories of the Army Medical Museum.

² Formerly First Lieutenant, Medical Corps, U. S. Army.

Malignant Tumors

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TABLE I.—*Malignant Tumors in Troops in U. S. A.*

Carcinomata.....	17	average age 30 years.
Sarcomata.....	14	" " 24 "
Melanomata.....	3	" " 28 "
Hodgkin's.....	3	" " 23 "
Hypernephroma...	1	" " 40 "
Teratomata.....	9	" " 27 "
Gliomata.....	4	" " 25 "

Total.....51—of which 34 were autopsy, 17 surgical diagnoses.

TABLE II.—*Malignant Tumors in Troops of the A. E. F.*

Carcinomata..	9 ¹	average age 30 years.
Sarcomata....	14 ¹	" " 26 "
Melanoma....	1	" " 23 "
Hodgkin's....	1	" " 24 "
Teratoma....	1	" " 24 "
Gliomata....	7	" " 25 "

Total.....33—all of which were autopsy diagnoses.

The locations of the carcinomata were as follows:

Troops in the United States

	AGES
3 rectum or sigmoid—all adenoma destruens type, no metastases.....	49, 39, 31
1 colon—hepatic flexure, no metastases; colloid type.....	20
1 caecum—colloid type, no metastases.....	?
1 appendix—alveolar cell type, no metastases.....	30
1 pylorus—adenocarcinoma, no report of metastases.....	?
2 pancreas—one with metastases in liver.....	35
one with metastases in lungs of adenomatous type.....	30
2 prostate—one forming large pelvic mass with metastases to liver and lungs.	33
one soft, rapidly degenerating, metastases to para-aortic glands and heart.....	21
2 penis—one squamous, no metastases (surgical).....	31
one squamous, metast. to inguinal glands (surgical).....	30
1 adrenal—adenocarcinoma of the cortex, no metastases.....	30
3 origin not determined—one showed nodules of papillary adenocarcinoma in liver; no further data.....	?
17 one showed adenocarcinoma in para-aortic glands and lungs; one testis removed before entering army, cause and findings unknown	24
one showed a round mass 5 cm. diameter of adenocarcinoma in upper mediastinum, large, well formed acini; no other lesion found.....	25

Troops of the A. E. F.

2 sigmoid—both adenoma destruens type, 1 perforating.....	22, 24
3 stomach—one cardiac end, metast. to liver, pancr., kidney.....	50
one lesser curvature at cardiac end, no metastases.....	21+
one polypoid over whole mucosa, invasion of diaphragm and mediastinum; metastases kidney.....	29

¹ In 2 carcinomata and 5 sarcomata the diagnosis is questionable.

1	right pleura—invading base of right lung, diaphragm, liver, and mediastinum; metastases to left lung, liver, peritoneum, and brain.....	?
1	bronchus?—adenocarcinoma in left lung, mediastinum, and neck; metastases to liver and kidney.....	34
2	?—one "liver, lungs, mediastinum and bronchial glands".....	23
—	one "miliary nodules in liver, spleen, lungs, kidneys, brain; ulcers in bladder".....	33

The varieties of sarcomata were as follows:

Troops in the United States

	AGES
5 lymphosarcomata—two involving chiefly mediastinum.....	28, 23
three chiefly retroperitoneal and abdominal.....	23, 22?
5 osteogenic—one of ilium and pelvic bones with extensive metastases to lungs.	19
four of bones of the leg (surgical).....	30, 30, 20
1 chondrosarcoma—of femur, malignant, no metastases (surgical)	21
1 giant cell—of femur, malignant?, (surgical).....	29
1 mixed cell—from tentorium cerebelli.....	23
1 mixed cell—spreading over all abdominal organs, origin back of caecum?... ..	23

14

Troops of the A. E. F.

8 lymphosarcomata—four chiefly mediastinal masses; of which 2 were the leukosarcomatosis of Sternberg.....	28, 24, ??
two chiefly retroperitoneal or abdominal.....	??
one nodules in liver and kidneys only (spleen?).....	27
one pleura and left lung, mediastinal, bronchial and mesenteric glands, liver, kidney, and bones of skull; "primary near hip or femur" ? micrometer examination made.....	?
1 osteogenic—primary at lower end of radius, nodule on humerus, many metastases to lungs.....	31
5 ? possibly inflammatory—one lympho-?, nodular tumor of mesentery.....	?
one lt. inguinal glands large, soft, necrotic.....	22
one cervical glands large soft, breaking down, caseous nodules in lungs.....	?
one hard mass left psoas region with abscess and general peritonitis	?
one abdominal, mesenteric and retroperitoneal glands and spleen	
nodular, gray, firm, also purulent; ascites 3000 c.c. (negro).....	22

14

The melanomata all arose from pigmented moles of the skin.

- 1—from temporal region, metastases to liver, spleen, lungs, and nearly all the bones of the trunk.
- 1—probably from an ulcerating wart on the toe; first recognized by the metastases to inguinal glands; later to the liver and omentum.
- 1—(A. E. F.) from the left parotid region, metastases to heart, lungs, liver, peritoneum, etc.
- 1—(surgical) from a pigmented naevus of the buttock, which started to grow after irritation by riding horseback; no metastases as far as known.

The cases diagnosed Hodgkin's disease were all fairly typical; all had a gland removed in the early part of the disease for diagnosis, and typical Hodgkin's granuloma was present. Later the cases came to autopsy with lesions distributed as follows:

3—a dense mediastinal mass infiltrating the roots of the lungs, the bronchial and cervical glands; one had also extended through the diaphragm to the pancreas and kidneys, and had eroded the anterior chest wall, forming an abscess draining to the outside.

1—(A. E. F.) was chiefly retroperitoneal, with involvement of liver, spleen, and mesentery, with less massive and less dense extension to the mediastinum and glands of the neck.

The teratomata were shown to be of tridermal character in all but three cases; in these three the whole of the original tumor could not be examined, but as Ewing and others have shown that probably all testicular tumors are teratoid in nature, they are listed with the others.

3—tumors of testis alone, removed surgically, no metastases.

4—tumors of testis with carcinomatous metastases to lungs, liver or other organs. (one from A. E. F.)

2—tumors of testis with extensive chorionic-epitheliomatous metastases to kidneys, intestines, liver, lungs, brain, etc.

1—tumor of the upper mediastinum weighing over 10 pounds, compressing but not invading the organs of the thorax.

The one case of hypernephroma was a large, soft, yellow tumor occupying the left flank, originating from the upper pole of the left kidney, extending into neighboring tissues, but without distant metastases.

The gliomata, eleven cases in all, were distributed in various parts of the cerebrum and cerebellum; most were cystic, and one was said to be multiple.

In addition to these tumors there were three others which were of unusual interest, although probably benign and hence not listed above.

An adamantoblastoma was found on the jaw of a boy of 19 and surgically removed; he had been first injured by brass knuckles in a street fight in Florida; the jaw was broken, several teeth knocked out, and osteomyelitis developed. Several months later a swelling at the site of the injury had enlarged to about the size of a hen's egg, and on examination proved to be a rather slow-growing neoplasm of the type named above. (Museum accession number 614.)

An officer, aged 59, after a series of illnesses not directly connected with each other, had one kidney removed at operation because of pain, hematuria, and decreased function. On examination the pelvis of the kidney and 5 or 6 cm. of the proximal portion of the ureter was found to be covered with a fine, papillomatous epithelial growth, sessile rather than polypoid. There was slight damage to the kidney tissue from pressure, but no invasion or other evidence of malignancy. (Museum accession number 1343.)

In a negro, aged 26, who died of influenzal pneumonia at Camp Meade there was discovered at autopsy a rounded tumor 8 to 10 cm. in diameter situated between the kidney and adrenal on the right side, but invading neither of these organs. The tumor was firm, cut like fibrous tissue, and was not very vascular. On microscopical examination it was seen to be made up of fibrous and neuroglial tissue with large numbers of well-developed ganglion cells scattered through the growth. The diagnosis of ganglionic-neuroma was made. There was no evidence of malignancy. (Museum accession number 772.)



A NOTE ON TWO PANAMA MOSQUITOS (Diptera, Culicidae)

HARRISON G. DYAR* AND C. S. LUDLOW†

IN THE collections made by Army Surgeons and received at the Army Medical Museum during the last few months have been some very interesting specimens. A new *Culex* from Panama (*C. dysmathes*, Ins. Ins. Mens., ix, 46, 1921), was published lately, and now we have further material of especial interest.

Hitherto no male has been known in the Sabethid genus *Prosopolepis* Lutz, though besides the specimens on which the genus was founded there have been received hand catches from Culebra, Empire, and Camp Gaillard containing a number of females. Among those taken at Culebra is a single male the characters of which are given below.

Four species have been described in the genus *confusus* Lutz (*Imprensa Med.*, 312, 1905) and *flui* Bonne-Webster & Bonne (*Ins. Ins. Mens.*, vii, 169, 1920), with the scales on the clypeus white and confined to the front margin, and *jocosa* Dyar & Knab (*Proc. U. S. Nat. Mus.*, xxxv, 64, 1908) and *prolepidis* Dyar & Knab (*Ins. Ins. Mens.*, vii, 1, 1919), with the scales on the clypeus black and covering the whole surface. The specimen before us belongs to the latter group. In *jocosa*, known in a single female from Caldera Island, Panama, the size is larger, the pleura and venter of abdomen contrastingly pale, the prothoracic lobes with a little of blue tint, the white eye-margins not reaching the vertex of the head. In *prolepidis*, described from Culebra, Canal Zone, the size is smaller, the pleura and venter darker, the prothoracic lobes without blue tint, the white eye-margins reaching the vertex. The specimens before us correspond with the latter species in both the characteristics given and in the locality.

The single male of *Prosopolepis prolepidis* D. & K. before us is too much damaged for description. The palpi are short as in the female, but the antennae, unfortunately, are lost. The male hypopygium exhibits the characters of the *Sabethes* group, confirming an opinion previously expressed (Dyar, H. G., *Ins. Ins. Mens.*, vii, 142, 1919).

Hypopygium (Fig. 1). Side piece conical, constricted outwardly, hirsute along the margin and with three long hairs below. Clasper furcate, one limb slender, the other broadly flattened, minutely haired outwardly, with a slender inner arm, bearing a minute seta at its tip. Tenth sternites simple, dentate at tip, Aedoeagus invisible. Ninth tergites bar-like, each with four large, strongly flattened appendages.

*U. S. National Museum.

†Army Medical Museum.

The genus does not differ essentially from *Cleobonnea* Dyar (Ins. Mens., vii, 134, 1919).

The life histories and larvae of the four species of *Prosopolepis* are unknown, but Mr. Shropshire, referring to this species, writes: "It may be a specimen of a mosquito which breeds in cup-like shells which enclose the blooms of the seed palm. These shells remain on

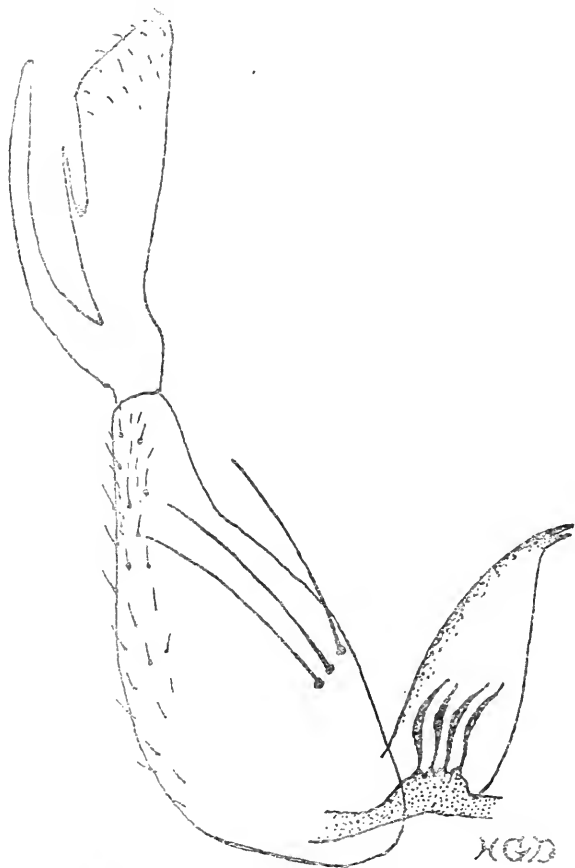


Fig. 1. *Prosopolepis prolepidis*—Dyar and Knab.

the tree midway up, and readily catch and hold water. I have found them (some larvae) once breeding in these shells, and have been endeavoring to collect some for you." This is of course merely a suggestion, and must await confirmation before it is considered seriously. No statement was made as to breeding places of the collection in which this male was taken, and as it was a "hand-catch," and contained *Wyeomyia* (*Decamyia*) *onidus*, *Wyeomyia* *pandora*, *Joblotia* *digitatus*,

Mansonia titillans, some *Mycetophilidae*, and *Hemiptera*, no conclusion can be drawn.

Length; unknown, the genitalia were removed before any measurement was taken.

Habitat; Culebra, but the species is taken in other localities in the Canal Zone.

Taken; December 13, 1920, in a collection with 14 females. Also at Culebra, November 12, 18, December 30, Empire, September 26, December 31; Camp Gaillard, January 20. This male and five females have been deposited at the U. S. National Museum.

We have also a male *Haemagogus* of an apparently new species taken at Corozal.

***Haemagogus Argyromeris*, new species**

(Male.) Head black, covered with flat brilliant blue scales, and a few white ones on the side which in some lights appear to extend as a narrow line around the eyes; a few heavy black bristles around, and two projecting forward between the eyes. Antennae light with black verticils and a black band at the base of each whorl; the distal joints elongated as usual, but unusually hairy. Proboscis dark, long and slender, black-scaled, with purplish reflections, a small tuft of black hairs at the very base on the ventral aspect; the labellae small, with many short hairs. Palpi short, slender, black. Clypeus black, nude, and shining. Eyes black.

Thorax: prothoracic lobes rather closely approximate dorsally, collar-like, covered with brilliant blue flat scales and a few black bristles. Mesonotum black, covered with brilliant blue flat, elliptical scales, a few black bristles at the nape, and a bunch of long ones at the wing-joint. Some white flat scales on the lateral margin just cephalad on the wing-joint, apparently an extension of those on the pleura. Scutellum dark, covered with brilliant blue flat scales and long black bristles on each lobe. Metanotum brown with a few minute brown setae close to the caudad margin. Pleura black with many brilliant white scales.

Abdomen black, with dark scales showing as brilliant blue, purplish or even reddish, depending on the light, and large silvery white lateral spots which extend on some segments to form white bands. The first segment has a median spot of brilliant blue, and lateral spots of silvery white scales. The abdominal marking is very irregular, and the scales so influenced by the direction of the light that it is difficult to say where the white begins or ends. Apparently the fifth and sixth segments are basally white banded, but on the more proximal segments the bands often appear to be in the middle of the segment; the seventh segment has a white spot, and the eighth is dark. The ventral marking is quite

as irregular, the dark scales changing from brown to blue, purplish and reddish, and the silvery white usually forming basal bands except on the distal segments which are dark. The eighth segment is very hairy.

Legs: in some specimens the coxae are heavily white scaled and all the trochanters are light. The femora are white at the bases, more marked on the mid-legs, and extending more than half the length of the femur on the hind legs, otherwise the legs are brown-scaled, with blue to purple iridescence. The scales seem somewhat roughened and there are tufts of scales at the apices of some of the joints.

Claw formula 1.0-1.0-0.0.

Wing smoky, brown-scaled. First submarginal cell much longer and narrower than the second posterior, the petiole a little shorter than the cell (15-20), that of the second posterior cell twice as long as the cell; the posterior cross vein more than twice its length from the mid-cross vein. Halteres with dark stem and silvery white knob.

Length: about 3.5 mm. without proboscis, proboscis nearly 2 mm. wing 2 mm.

Habitat: Corozal, C. Z.

Taken October 27.

Described from eight males bred from larvae taken in a "container." The somatic markings are probably not thoroughly developed, and suggest those on the females which have been reported as *H. equinus*, but the genitalia show characteristic differences.

Hypopygium. Side piece three times as long as wide, rounded at tip; a small rounded setose lobe at the extreme base within; dense scales toward the tip broad and rounded; a tuft of setae at tip. Clasper moderate, enlarged outwardly, club-shaped, the spine inserted on one side of the tip, pointed. Claspette with slender bent stem, its outer portion enlarged into a rounded disk, with a single seta on one edge, the disk minutely and sparsely ciliate; filament broad, folded over on the disk of stem, widely emarginate, forming on one side of the seta a slender curved point, on the other less slender and with basal ribs.

Types, eight males above referred to, four deposited in the U. S. National Museum, type No. 24,333, and four retained in the Army Medical Museum.

Neither of these species belong to groups known to be connected with disease, but the appearance in some numbers of what has been considered a rather rare species, shows that we have much yet to learn as to these Central American forms and it may easily be that additional groups may be found to belong to the disease carriers. Careful and extended collections are needed from all our tropical and subtropical possessions.

MEASLES VIRULENCE: EXPLANATION OF VARIATION

(One illustration)

By JAMES G. CUMMING, M.D., DR. P. H., *Ann Arbor, Michigan.*

DURING 1918 among our troops in the United States there were four times more measles per 1,000 troops than among our forces in Europe. If the fatalities from this disease had followed the same ratio, there would have been four times more deaths per 1,000 cases among troops in the United States than among those in France. On the contrary, in the United States there were but half as many deaths per 1,000 cases as in France. In other words, for measles the case fatality rate—which is the number of deaths per 1,000 cases—was two-fold greater for troops in France than for those in the United States. Among our troops abroad there were 42.6 deaths per 1,000 cases of measles; while for troops in the United States there were but 23.7 per 1,000 cases of this disease.

Why the unexpected difference in these death rates for the two groups? The explanation hitherto accepted would be that the "virulence of measles virus" was greater in one group than in the other. There is, however, no proof of variation in the virulence of measles virus. The variation in the virulence attributed to measles will be here shown to lie in the varying prevalence of pneumonia complications. In the consideration of deaths attributed to measles there are two definite factors: one is the measles infection, the other, the complications. The measles infection *per se* is rarely fatal; on the other hand, the complications are the contributory and immediate cause of death. We are not, then, so much interested in the prevention of measles as in the prevention of measles complications. Nor are we interested in the mortality rate from measles, but rather in the mortality rate from measles complications, for uncomplicated measles caused but 3 per cent of the total deaths attributed to this disease. These complications—the immediate cause of death—are due chiefly to the allies of measles, the pneumonia-producing group of organisms. These have, as their primary focus of infection, the tonsil, the involvement of which constitutes the so-called "healthy carrier state." The secondary invasion by these organisms may result in pneumonia, empyema, septicemia, joint involvement, endocarditis, etc. Is, then, the problem one of preventing measles, or one of preventing the measles complications? The natural answer to this question is the prevention of both, but since uncomplicated measles is rarely fatal, the problem would seem to resolve itself—

as far as mortality is concerned—fundamentally into one of preventing pneumonia or its allied complications.

Shall procedures for the prevention of these complications be limited to prevention of cross-infections of pneumonia on the measles ward, by the use of the cubicle and the mask and precautions against indirect contact transmission? Rather, should not anticipatory measures be instituted among well troops in the field and among the civil population, with the view of preventing the healthy carrier state by group and individual sanitary protection? I, as well as my collaborators, have contended that the solution of the prevention of mortality attributed to measles, is not so much dependent upon preventive measures instituted in the hospital after the individual has developed measles as it depends essentially on the prevention—prior to measles infection—of the healthy carrier state. In the main this carrier state arises in the camp, and also during civilian life prior to induction into the service. This contention is substantiated by the fact that, in spite of increasing vigilance in preventing cross infection in military hospitals, the complication rate was higher in 1918 than in 1917, as is shown by the 1919 Annual Report of the Surgeon General, U. S. A., and from which Report statistical data here presented were compiled. Complication rates involve an understanding of the case fatality rate. In typhoid, the case fatality rate is due to typhoid; in measles it is due to pneumonia or its related complications; therefore a consideration of this epidemiological complex is necessary in coping with so-called measles mortality.

MORTALITY FORMULA BASED ON CASE FATALITY

In order to make it plain that mortality attributed to measles is not dependent on measles incidence, but on the complication rate incident to the pneumonia carrier rate, the following simple formulas are presented.

The mortality per 1,000 troops is usually derived from the following formula:

$$\frac{\text{Number of deaths} \times 1,000}{\text{Strength}} = \text{mortality per 1,000 troops}$$

This formula gives us no clue as to the number of deaths per 1,000 cases. Herein it is weak, because an understanding of this (the case fatality rate) is essential for an understanding of the problem of preventing the mortality attributed to measles. The case fatality rate is more essential than the mortality rate; only case fatality rates indicate the epidemiological complexities which are basic in the prevention of virus disease mortality.

In working out a formula for the mortality rate on the basis of the

case fatality rate the following steps are included: First, since measles is rarely fatal when not complicated—less than 3 per cent of the total deaths were uncomplicated—the following may represent the mortality rate when 100 soldiers in an organization are attacked by uncomplicated measles:

$$\begin{array}{ccccc} \text{Measles rate} & & \text{Complication rate} & & \text{Mortality rate} \\ \frac{100 \text{ cases}}{1,000 \text{ strength}} \times & & 0 & = & 0 \end{array}$$

On the basis of this formula it is not the measles rate which determines the mortality, but the complication rate, and, since the complication rate was zero, there was no mortality. It should, however, be understood that about 25 per cent of the complications are fatal. This is shown by the fact that in 1918 among the troops in the United States there were 3,584 complications following measles infection and that 911 or about 25 per cent, of these terminated fatally. Therefore the deaths per 1,000 cases of measles are equal to the total complications minus the recoveries in this group of 1,000 cases, or:

Per 1,000 cases

$$\text{Complications} - \text{Recoveries} = \text{Case fatality rate}$$

The concluding formula is then as follows:

$$\frac{\text{Measles cases} \times 1000}{\text{Strength}} \times \frac{\text{Case fatality rate}}{1,000} = \text{mortality rate}$$

Therefore, it follows that any number of cases (as 100, for example) of uncomplicated measles in an organization will have a mortality of zero:

$$\begin{array}{ccccc} \text{Mortality rate} & & \text{Case fatality rate} & & \text{Mortality rate} \\ \frac{100 \times 1,000}{\text{Strength}} \times & & \frac{0}{1,000} & = & 0 \end{array}$$

EXAMPLE OF VARIATION IN CASE FATALITY RATES

The importance of this formula lies in bringing to one's constant attention that most important item, the case fatality rate. This is exemplified when the formula is applied to conditions at Camp Devens. During the last quarter of 1917 there were among 25,139 troops at that camp, 200 cases of measles with but a single complication—and no resulting deaths. For this period the formula with its resultant case fatality rate of zero is as follows:

$$\begin{array}{ccccc} \text{Case rate} & & \text{Case fatality rate} & & \text{Mortality rate per 1000} \\ \frac{200 \times 1000}{25139} \times & & \frac{0}{1000} & = & 0 \end{array}$$

In contrast to the above case fatality rate of zero, we find that for the first quarter of 1918 this rate was 29.5 among 338 cases of measles. Among these cases there were 78 complications, 10 of which were fatal, giving a case fatality rate of 29.5 per 1,000 measles cases:

Case rate		Case fatality rate		Mortality rate
$\left(\frac{338 \times 1000}{25139}\right) \frac{13.5}{1}$	\times	$\frac{29.5}{1000}$	$=$	0.4

While for the first period there were 200 cases with no complications, consequently a case fatality rate of zero, during the second period there were 338 cases with 78 complications, 10 of which terminated fatally, or a case fatality rate of 29.5. In the first period the mortality rate was zero; while in the second it was 0.4 per 1,000 troops.

MEASLES COMPLICATIONS MOST FATAL TO THE SEASONED SOLDIER

Although Camp Devens is taken as an example of this epidemiologic phenomenon, the camps as a whole follow the general rule: with the seasoning of troops the measles complication rate and the resultant case fatality rate increase.

The first epidemic appearance of measles immediately following mobilization showed but few complications and but few deaths, indicating that there had been but few carriers. But as time went on with increasing exposure to the carrier state, more and more men became carriers of the potentially dangerous group of pneumonia-producing organisms; as a result the complication rate increased.

Application of the formula which brings out the case fatality rate makes plain, as demonstrated in the Camp Devens example, that it is not the measles case rate, but rather the case fatality rate which determines the mortality per 1,000 troops. Furthermore, the mortality rate can hardly be accepted as an indication of the virulence of a measles epidemic, for, as has been said, the virulence attributed to measles lies in the varying prevalence of pneumonia complications.

In this connection attention may be called to the argument advanced by some investigators that the virus is more virulent in one epidemic than in others; it is not, however, specifically stated whether or not this estimate of virulence is based on an excessive case rate, or on a high mortality rate. As previously shown, neither of these rates is of itself significant, because among recruits we usually have an excessive measles case rate, but a low case fatality rate; while the reverse of this is true for seasoned soldiers.

The theory might be advanced, as a remote possibility, that the same virus or organism which causes measles is also the cause of the complications, and that the increase in the complications among seasoned

soldiers is due to an increase in the virulence of the measles virus, resultant from its rapid successive passages through the human host. There is no proof that measles virus varies in virulence; on the other hand, laboratory research, both ante-mortem and post-mortem, demonstrate that the varying mortality attributed to measles is due to the secondary invaders. Chief of these is the hemolytic streptococcus which, lying in wait, as it were, takes advantage of the lowered resistance of the host during the measles infection. The potentially dangerous carrier state of the hemolytic streptococcus in the tonsil, then becomes actively dangerous in that pneumonia involvement often occurs, and may extend to the pleura, the pericardium and blood stream, terminating in death.

The healthy pneumonia carrier rate determines the variation in the virulence attributed to measles virus. Among recruits there is a low pneumonia carrier rate, a low measles complication rate and a low case fatality rate; on the contrary, the seasoned soldier has a high pneumonia carrier rate, a high measles complication rate, with the resulting high case fatality rate. The virulence of a measles epidemic among seasoned soldiers is due to this high pneumonia carrier rate.

PRE-HOSPITAL CARRIER STATE

As has been already pointed out in this paper, pre-hospital sanitary protection in civil life and in the camp, is more preventive of measles complications than is the prevention of cross infections in the hospital. Though, as time went on, there were more exacting regulations relative to the use of the cubicle and the mask, the complication rate increased with the successive periods of the war. This increase in the complication rate was due chiefly to an increase in the pneumonia carrier rate in the camps. Here again, our laboratory investigations may be referred to in which it was shown that 35 per cent of measles patients were hemolytic streptococcus carriers upon entering the hospital, and that 94 per cent of all pneumonia complications in measles cases occurred among those identified upon entrance as healthy carriers.¹

CASE FATALITY RATE AT HOME AND ABROAD

One purpose of this paper is to draw a comparison between the case fatality rates for troops in Europe and those at home. The A. E. F. troops were men of considerably longer service than those at home. In addition to the longer service they were, on train and transport, afforded a lower degree of sanitary protection than was given men in the home camps. Longer service and greater exposure incident to

¹ Cumming, Spruit, Aten. Streptococcus Pneumonia, J. A. M. A., Mar. 8, 1919. Vol. 72, pp. 704-707.

travel, resulted in a very considerable increase in the hemolytic streptococcus carrier rate. In fact, we found that 590 well troops debarking from France had hemolytic streptococcus carrier rates of 35 per cent.

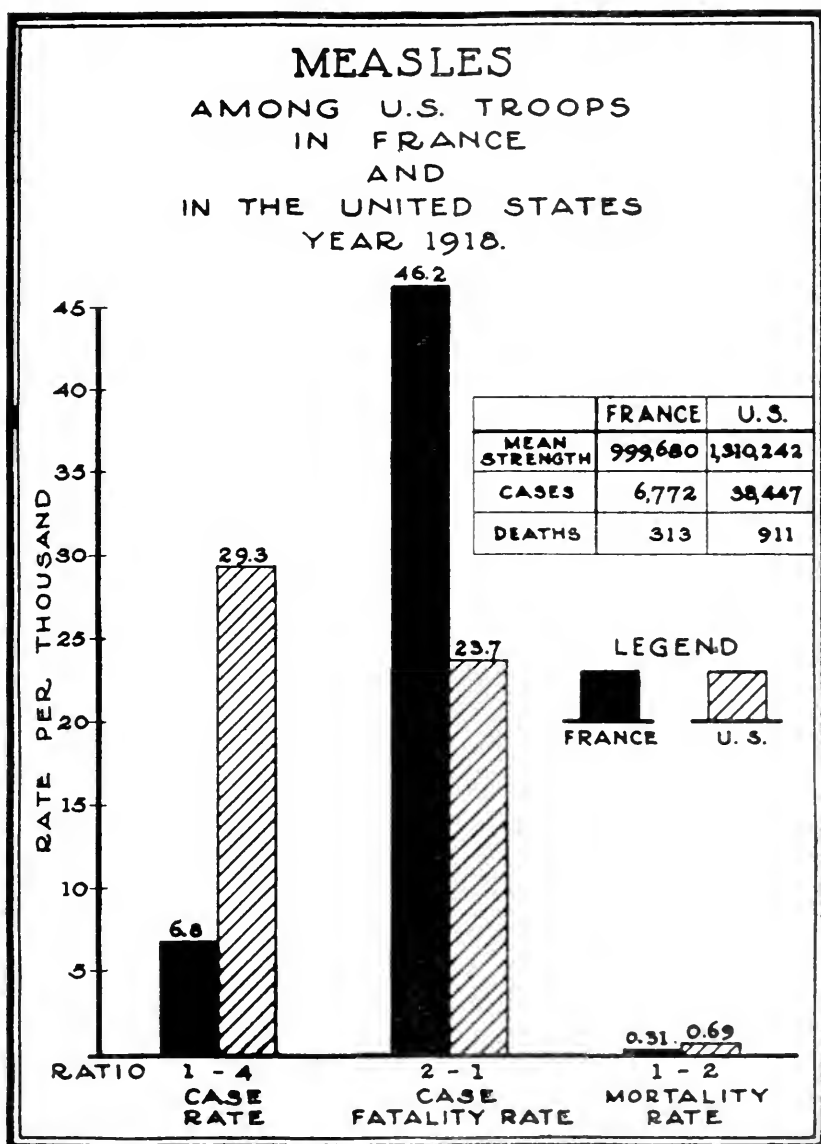
It will be of particular interest to note that in one organization of 104 men who had been in the service ten months or longer, the carrier rate was found to be as high as 82 per cent. The procedure of finding such a high carrier rate was based on four successive daily examinations. In this connection it will be recalled that the theory of the prevention of hemolytic streptococcus pneumonia by the use of the cubicle and the mask for patients on the measles ward, was supported by the finding of an apparent increase in the hemolytic streptococcus carrier rate among measles patients. This apparent increase was demonstrated by one group of investigators² through successive examinations of a group of 44 measles patients. The rate increased from 11.4 per cent on the first examination to 37.6 per cent on the second, and to 56.8 on the third. Likewise a second group of investigators³ reported that on a measles ward composed of fifteen carriers and fifteen non-carriers, only six non-carriers remained at the end of a week, and that those who had become carriers while on the ward were "slightly infected."

In contradiction to the usual conclusions drawn from these two experiments, it may be pointed out that there was no report of a control having been run among healthy troops in either series of experiments. Furthermore, in order to demonstrate that a similar result—which is due to the identification of carriers previously missed, owing to light infection or to imperfections in laboratory technique—is obtainable among healthy troops, the following investigation was carried out at the Port of Embarkation, Newport News, in 1919: From an organization of well troops 104 men selected at random were examined by the deep culture method on four successive days for hemolytic streptococcus. The results were as follows: the first examination showed 42 positive, the second 28 additional, the third 10 additional, and the fourth 5 additional, making a total of 85 hemolytic streptococcus carriers or 82 per cent positive. These men were not exposed, as were those in the two previous experiments, to "hospital infection"; yet here was demonstrated an apparent increase in the carrier rate similar to that in the hospital experiments. As a matter of fact, however, the actual carrier rate among well troops does not double in a period of four days; here, as in the hospital experiments, there was not an increase in the number of carriers; the increase was in the number of identifica-

² Cole and McCallum: Pneumonia at a Base Hospital, *Jour. A. M. A.*, April 20, 1918, p. 1146.

³ Levy and Alexander: The Predisposition of Streptococcus Carriers to Complications of Measles. *Ibid.*, June 15, 1918, p. 1327.

tions. This margin of inaccuracy in present laboratory technique is admitted by the universal rule requiring three successive negative findings before a diphtheria patient is released from quarantine. This same



inaccuracy is acknowledged when the laboratory identification of hook-worm, malaria, tuberculosis, etc., relies on repeated examinations; it is these successive examinations which identify the lightly infected.

If increasing length of service and higher hemolytic streptococcus carrier rates are influencing factors in determining the mortality rate attributed to measles, then troops in France should have suffered a much higher case fatality rate than those at home. This is found to be true in the accompanying chart which shows that for the year 1918 there were 46.2 deaths per 1,000 measles cases in France; while there were but 23.7 deaths per 1,000 cases for those at home. Per 1,000 cases the death rate was two-fold greater for those in France. We have here a death rate which parallels the length of service and the increasing streptococcus carrier rate. It is of interest to note that the statistical data here presented substantiate our epidemiological deductions derived from laboratory investigations, viz.: the streptococcus carrier rate increases with the length of service; consequently, the case fatalities of virus infections—measles, etc., should correspondingly increase. Among troops in Europe only 2 per cent of the total deaths attributed to measles were uncomplicated; broncho and lobar-pneumonia were responsible for 88 per cent of the fatalities attributed to the disease, and the remaining complications, while due to the pneumonia group of secondary invaders, involved the mastoid, pleura, endocardium, etc. Since 98 per cent of the total deaths were due to secondary invaders, our greatest hope in preventing mortality from epidemic measles lies in the maintenance of a low healthy carrier rate. In addition, sanitary protection against acquiring the carrier state will likewise protect against measles infection.

It is important to note further that *in France per 1,000 cases of measles, the pneumonias, exclusive of their related complications such as empyema, otitis media, etc., were more frequent and more fatal than among troops in the United States.* In France the pneumonia complication rate was 79 per 1,000 measles cases; while the rate was but 34 per 1,000 cases in the United States. In France these pneumonia cases had a case fatality rate of 513 per 1,000; whereas in the United States the rate was 407 per 1,000.

The pneumonia complication rate for measles was 132 per cent greater and the pneumonia case fatality rate was 25 per cent greater for our troops in France than for those in the United States. This two-fold influence accounts for the greater mortality in France for the pneumonias contributory to measles. There were not only more pneumonia carriers among the troops in France, but there was a heavier carrier state. Owing to this heavier carrier state, it could probably be shown, if the data were available, that the pneumonia complications not only set in earlier after the onset of measles, but terminated more quickly as well as more fatally. It is our impression, as a result of laboratory

investigations of the hemolytic streptococcus indices among measles cases, that the heavier this carrier state the more likely was the patient to develop streptococcus pneumonia. In our series of measles cases 33 per cent of the carriers developed pneumonia and the heavier the carrier—the man with the larger dose—the more liable he was to develop this complication.

Typhoid ran rampant during the Spanish American War; yet during the World's War, only twenty years later, the typhoid mortality was low owing to three factors: first, the enormous reduction in typhoid among the civil population (due, not to vaccination, but to sanitary measures) which resulted in a correspondingly decreased healthy carrier rate among recruits; second, the almost perfect sanitary protection against typhoid distribution in the camps, and third, the typhoid vaccination of troops. In the World's War, on the other hand, the pneumonias were responsible for over 75 per cent of the total deaths from disease. Just as the typhoid mortality has been reduced, so can the soldier in the next war be protected from this high pneumonia death rate. He must be given such continuous sanitary protection as will break the chain of pneumonia transmission and maintain the streptococcus healthy carrier rate as low in the army as it may be for the civil population, which rate was 5 per cent prior to the World's War. Moreover, we must go a step further against pneumonia transmission, and establish this protection among the civil population, thereby insuring a low pneumonia carrier rate among incoming recruits. With but few primary sources among recruits, and as perfect sanitary protection against pneumonia transmission as has been erected against typhoid, pneumonia mortality should be materially reduced.

CONCLUSIONS

1. It is not the measles case rate, but the complication rate minus the recoveries—the case fatality rate—which determines the mortality attributed to this disease.

2. The complication rate increased with the length of service; likewise the mortality from these complications increased in proportion to the length of service.

3. Both the length of service and the hemolytic streptococcus carrier rate were greater for the seasoned troops in France than for those in training in the United States.

4. The measles complication case fatality rate—which was dependent on the healthy carrier rate—was two-fold greater for troops in France than for those at home.

5. Since the measles case fatality rate is an index of the pneumonia

healthy carrier rate, this case fatality rate is essential in an epidemiological study of measles.

6. The so-called "virulence of measles" is determined by the pneumonia healthy carrier rate.

7. Recruits were—owing to their greater mass susceptibility—more prone to measles, but seasoned soldiers were—with their higher pneumonia carrier rate—more prone to measles complications, and complications caused the fatalities.

8. Only 2 per cent of the total deaths attributed to measles in France were uncomplicated, and the pneumonias were almost wholly responsible for the remaining fatalities.

9. Inasmuch as 98 per cent of the mortality attributed to measles is due to complications incident to the healthy carrier state, it is imperative that adequate sanitary protection—pasteurization of eating utensils and hand cleanliness—be afforded, with the view of blocking the main avenues of transmission of the potentially dangerous group of pneumonia-producing organisms. This will be a two-fold blocking inasmuch as both measles and pneumonia are saliva-borne infections.



THE COSTOCHONDRAL GRAFT FOR THE REPAIR OF SKULL DEFECTS

By ADOLPH M. HANSON, M.D., DRS. HAESSLY, HANSON and TRAEGER,
FARIBAULT, MINNESOTA

SKULL defects may be classified as: large or small; pulsating or non-pulsating; frontal, occipital, parietal, and defects of the upper vault.

Skull defects requiring graft for repair are usually the result of injuries to the skull and operations made necessary thereby. It is of utmost importance in operations on the skull to avoid larger defects than are required to properly care for conditions that may be found underneath the injury. For this reason, the writer avoids trepanation in depressed fractures of the lower frontal and suboccipital regions where the bone is dense and thick. In injuries of this nature the margins of the depression are enlarged by rongeurs, unless the injury is over a sinus, when trepanation is always done.

The indications for skull graft are: (1) defects which pulsate and cause headache, vertigo, nausea, and weakness at rest or on exertion; (2) for cosmetic reasons.

It has been the practice of some surgeons to use thin cartilage grafts, as they are pliable and easily handled; but it has fallen into disrepute because such grafts absorb. The writer uses a graft from one-half to two-thirds the thickness of the chondral rib. Such grafts do not absorb, but become firmly embedded, affording a dense protective layer.

The technique of the operation is briefly as follows: The head is painstakingly shaved and prepared by washing with soap and sterile water; sponged with ethyl alcohol; and dried by sponging with ether. The site of choice for securing the graft is over the costochondral cartilages of the 6th, 7th, and 8th ribs either side. This is prepared in the same way. Using a one-half per cent novocain solution of 60 c.c. to which 1-32 gr. of adrenalin chloride has been added, a block of scalp about the defect is injected; also a block of skin, including the deeper structures, at the site selected for securing the graft.

The old incision over the defect is reopened, if tripod, or a tripod incision made, exposing well beyond the margins of the defect, carefully separating the galea from the dura. The dura adherent to the margins is freed by the use of a dural separator. A piece of sterile cloth is now laid over the opening in the skull and an exact duplicate, the size and shape of the desired graft, is obtained. With the costochondral cartilages exposed, this is laid over the cartilages and a one-half to two-thirds longitudinal section of the cartilages of the same size

and shape is cut. Often it is necessary to remove additional costochondral cartilages, either from the opposite side, or from the 5th and 4th ribs of the same side, in order to secure enough graft for large defects.

Taking care that the head-wound is dry and all clotted blood removed, it is carefully sponged with ethyl alcohol and the graft laid on the dura with the smooth uncut surface inward. The scalp is now closed in layers, using interrupted No. 1 chromic gut sutures in the galea and interrupted silk sutures in the scalp. At no time during the operation are the gloves allowed to come in contact with the head-wound or the graft.

A pad of sterile gauze is placed directly over the defect and graft, and secured by adhesive strips in such a manner as to keep the graft firmly in place and prevent bulging. This pad is changed and carefully readjusted in three or four days when the silk sutures are removed; again one week later; and again ten days later. At the end of three weeks the graft has become firmly embedded and all dressings are removed. In large defects the writer keeps the pad in place for six weeks.



The Military Surgeon

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Original articles, items of news and matter of interest to the Services are welcomed. Requests or reprints should be made at the time of forwarding articles.

EDITOR,
COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

THE MEASURE OF THE MAN¹

In the February issue of the *Bulletin of the National Research Council* our good friend, Major Robert M. Yerkes, M. R. C., in conjunction with Miss Margaret V. Cobb, devotes seventy-four pages of text to the discussion and dissection of the mentality of the medical profession with particular reference to that fraction represented by the Medical Corps of the United States Army. In the tabular statement, he ranks the Engineer Corps first and the Medical Corps eighth, with the Dental and Veterinary Corps respectively ninth and tenth. Anything by Major Yerkes is entitled to thoughtful consideration; even this latter-day estimation of the weight of the soul. And still, acknowledging the accuracy of statistical methods and the validity of approved mental tests, we are inclined, with the rashness of the uninitiated, to reserve

¹Since writing the above editorial, the attention of the public has been directed through the press to the questionnaire ascribed to Mr. Edison as his basis for the employment or rejection of those applying to him for positions.

The consensus of opinion in regard to it seems to be that which has been expressed in the above editorial; namely, that no one coat will fit every man.

There is an old story told of a civil service examination for qualification for the position of letter carrier in an urban district. On the examination paper the following query appeared: "How far is it from the earth to the moon?" The harassed candidate answered, "Far enough away so that it would not interfere with my delivering letters to any house on my route." It seems as though the same answer might be applicable to a good many of the psychologically fantastic questionnaires which have their inception in the minds of those who are rather closely confined by the limits of some technical specialty.

for ourselves a certain measure of doubt as to the infallibility of the expressed findings and conclusions in the paper.

In the first place, while "tests is tests," just as certainly as "pigs is pigs," there is no absolute manner in which the interpretation of them by man or men may not be tintured by the personal equation of the investigator; the subliminal self which is not responsible to the thinking entity. Theorems and propositions in clear mathematics are self-constituted as to accuracy of conclusion because they depend on basic and unvariable physical laws for their justness or falsity. By just so much as you depart from the rigid confines of natural law, you bend the right line of science to a variable curve, the abscissa and ordinate of which is the composition of the interpreting mentality of the investigator. Results may (not must) give a general average on which to base deduction, but they do not carry the conviction of absolute scientific truth. Bearing this in mind, we acknowledge the value of the deductions of Major Yerkes and Miss Cobb.

We take, however, in their work, exception to some of the premises on which they found their conclusions. In the first place, a not unnatural inference from the work in question would be that the figures presented represented a survey of the commissioned personnel, the medical officers of the regular service. As a matter of fact, that was not practicable at the time the tests were made, since active preparation for and participation in the war put a large proportion of those in the regular establishment beyond the reach of the investigators. It may be admitted that in the statistics a certain proportion of this contingent did figure, but it is also true that mingled with it are the ratings of others who had been accepted on an emergency basis. Hence, we are unwilling to accept the deductions of Major Yerkes and Miss Cobb as an authoritative index of the personnel which goes to make up the customary quota of those in permanent employ of the Government as members of the Army Medical Corps. We do not advance the belief that such a survey would raise the rating, since that is beside the question when we desire only to demonstrate that the figures are not representative because they are not based on a strict and total analysis of the personnel in question.

We do, however, reserve the opinion that a survey so made would indicate a higher figure than the one given, and for these reasons:

The initial process of selection in the formation of the medical corps of the regular army is a strict one and the elimination incident to it necessarily provides a higher initial average on which to base a concept than is possible with a band of professional men chosen because there is crying need for any help which may be at all competent, even in the

lesser figures of value. This initial selection, plus the customary courses of instruction provided for by regulations, and with the added schooling attendant on service with seasoned senior officers, must inevitably make for the betterment of the initial coefficient of intelligence. That seems to us self-evident, and *ergo*, by just so much as you dilute this strain of improved thinking and reasoning by an untrained complement you will lower the general average. It would seem natural to us, therefore, to assume that the totals in the tables would represent a sum for all who were examined higher in rating than would have been obtained if the tests represented only those who had not received the additional training. We are ready to accept the conclusions reached as representing a figure for a certain total of the medical profession of the United States, but we reserve the right to question its accuracy as to our own corps until an unmixed test shall have been made.

The excellence of the Engineer Corps in the percentage distribution of psychological grades is not at all surprising, and one that might normally be expected. Mathematical physics is undoubtedly the highest department of human thought and good physicists are by nature acute and quick-minded people. As evidence of this it may be remarked that many of the great commanders were from this class. Napoleon's mathematical studies at Brienne may be held as evidence of this and both Lee and Joffre were Engineers. The passing of tests designed for psychologic ratings demand exactly this faculty of quick thinking, of instant proper decision, and while it is one which is ingrained in the mind of the mathematical physicist, it is by no means a normal or necessary attribute of the man of the medical profession, save in occasional and exceptional circumstances. Major Yerkes himself admits this when he says, on page 458 of his report, "Chief among the factors whose responsibility for the relatively low standing of medical officers has been suggested are: Age, habits of *deliberateness* and accuracy developed by professional training and experience, characteristics of the tests which render them easier for engineers than for medical officers." A further modifying circumstance, so far as the personnel examined by Major Yerkes is concerned, is given by him in the following paragraph:

"It is wholly clear that the medical profession has a large number of men who are intellectually incompetent and who should not have been allowed to study medicine, or having studied it, should not have been licensed as practitioners. The Army was constrained to accept their services because of an imperative need of medical officers. Ordinarily their applications would have received scant consideration.

"To the credit of the Medical Department of the Army is the fact that rank is more highly correlated with intelligence in the case of medical

officers than for any other military group. The intellectually low-grade men of the medical profession are almost invariably of low military rank, and promotion depends alike upon intellectual ability and professional value."

If we read this as it stands we may assume that the medical officer was rated not in accordance with a test designed to demonstrate his special ability, but by one which fitted the mind of the engineer. This does not seem to us to make for a precise finding.

Medicine is now a group of sciences of such vast extent that the diagnosis of a difficult case, if honestly made, requires mental abstraction and a due amount of deliberation. "Snap diagnosis" is no longer good form nor good practice. That it could be developed to a high degree, however, was manifest from the facility displayed in this field by Corvisart, Napoleon's physician, by Hebra, and in later times by Da Costa. But *tempora mutantur et nos mutamur in illis*, and as the measures for accurate findings in diseased conditions were improved the necessity for this "now or never method" disappeared. It seems as though it would be more rational that mental tests of adults engaged in various branches of science should be conducted with reference to the particular avocation of the individual rather than seeking to cut one coat to fit them all. It is axiomatic that examinations tend to show what one does not know rather than the knowledge he really possesses. All individuals have their "off" days when cerebration is at a low ebb, and a conclusion drawn from findings at such a time would be no true index of the normal mentality.

Sylvester, the great mathematician, discovered and developed many new departments of the higher mathematics; facts requiring unusual subtlety of mind; yet the tales of his absentmindedness are legion. When immersed in abstruse speculations he was "not at home" mentally, so far as his orientation to the external world was concerned. When he was a professor at Johns Hopkins he would frequently stop people on the street to ascertain where he was, even when in sight of his home or the university. Would it be fair or rational to judge an intellect such as his by tests in which a street gamin could easily surpass him?

JAMES ROBB CHURCH.

ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, May 2, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Navy

Lieutenant

Henry C. Kellers

Medical Corps, U.S.N.R.F.

Lieutenant Commander

William J. McGill

Lieutenants

James Thomas Brennan

George M. Constans

Norman Scott Cooper

Jesse Carl Cummings

William Wallace Holley

Samuel Ages Fuqua

Edward Lewis

Benjamin Dorez Parish

Albert Fowler Simpson

John O. Skinner

Richard Cecil Smith

Harris R. Sutton

William Howard Treat

Morris A. Weinstein

Simon Ben Whitlock

Medical Corps, U. S. Army

Majors

Samuel M. Edison

Ned Overton Lewis

Ambrose L. Lockwood

James J. McKinley

Edward C. Morton

Captains

Benedict Aron

Robert L. Peyton

Edwin R. Strong

Lieutenants

Edward A. Corcoran

Medical Reserve Corps, U. S. Army

Majors

Ernest E. Archer

Victor G. Bourke

Joseph F. Jaros

George A. Russell

Edward E. P. Sleppy

Captains

Arthur C. Bright

Swepson J. Brooks

Homer S. Hiatt

Lieutenants

Joseph T. Bazen

United States Public Health Service

Passed Assistant Surgeons

Earl Kemmer Langford

Edwin J. Rose

Assistant Surgeons

Oscar B. Yeatman

Acting Assistant Surgeons

Clement J. de Bere

Fred Guy Hall

National Guard

Maurice B. Mooslin

Capt. M.C., Calif. N.G.

Allen C. Beethan

1st Lieut. M.C., Md. N.G.

Lloyd H. Brannon

1st Lieut. M.C., Mo. N.G.

Thomas Jamer Collins

Capt. M.C., Mo. N.G.

Ernest Archibald Campbell

Major M.C., N.Y. N.G.

Webster Merchant Moriarta

1st Lieut. M.C., N.Y. N.G.

Albert Newton Cole

Major M.C., Penna. N.G.

William H. Grinnell

Capt. M.C., Vt. N.G.

Richard E. Elvins

Capt. M.C., Wash. N.G.

Associate Members

C. Leonard Cassell

Capt. D.C., U.S.A.

Walter C. Hauser

Capt. D.C., Wisc. N.G.

Barney M. Russell

Capt. D.C., Mo. N.G.

COMMENT AND CRITICISM

THE AIR MEDICAL SERVICE

During the World War about fifteen hundred temporary medical officers served at our Air Service stations. Many of these officers are now in the Reserve Corps, and many more are applying for commissions in that Corps. They will be interested to know that the Surgeon General has arranged to have them listed on his records as desiring to be with Air Service troops in case they are again called to active duty. A blank form is sent to all reserve officers, asking for a statement as to their qualifications and preference as to assignment. In this way reserve officers who have heretofore been on duty with Air Service troops may specify their desire in this respect.

A brief outline of the Air Medical Service is given below:

I. DUTIES AND FUNCTIONS OF THE MEDICAL DIVISION OF THE AIR SERVICE

The Medical Division is under the direction of the Chief of Air Service. It is charged with the supervision of all matters pertaining to Medical Department personnel, sanitation, and hospitals at Air Service stations which are under the direct control of the Chief of Air Service, also the Medical Research Laboratory and School for Flight Surgeons. This division exercises supervision over the technical work of flight surgeons and rebreather units at all Air Service stations, also the special work required by Army Regulations regarding the physical examination for flying, including the compilation of statistics on these examinations and on crash reports prepared by flight surgeons. As a result of investigations and experience acquired it makes such recommendations as will tend to increase the efficiency of the flying personnel.

II. THE MEDICAL RESEARCH LABORATORY

This Laboratory is located at Mitchel Field, Long Island, and is under the direction of the Chief of Air Service. The Laboratory conducts such medical, physiological, and psychological investigations upon matters pertaining to the medical problems of flying and the physical examinations for flying, special examinations, and rebreather examinations as may be directed by proper authority. The Laboratory is equipped with elaborate apparatus and appliances for research work and has a selected personnel well qualified for this special research work.

III. SCHOOL FOR FLIGHT SURGEONS

This special school is conducted at the Medical Research Laboratory, at Mitchel Field, Long Island. Its object is to train specially selected

medical officers for duty at flying fields, so that the information which has been obtained through the Medical Research Laboratory and through the experience gained at flying fields can be properly applied to lessen the risks taken by pilots. The course of instruction at this school covers a period of three months. In addition to strictly Air Medical problems, the students are given a thorough course in advanced work on eye, ear, heart, nervous system, and mental diseases, in order that they may be able to make the highly technical examination now required of fliers by Army Regulations. None of this advanced work can be obtained at any other place. The instruction given consists of lectures, demonstrations and practical work in normal physiology of respiration and circulation and in the physiology of respiration and circulation of the flier when exposed to high altitudes. The ability to differentiate the arrhythmias and all types of valvular heart disease is acquired from clinics and lectures. Methods of new and special examinations of the ophthalmologic and otologic apparatus are taught, and each student flight surgeon is required to make a number of complete examinations of the eye and the ear. In psychiatry the general field is covered by lectures and clinical work, and special attention is devoted to the making of personality studies. In psychology the instruction consists of a study of elementary psychologic methods and the psychology of aviation, a subject which has to do with the mental adaptability of the flier to the work required of him. In physics, such matters as oxygen-supply apparatus, aviators' goggles, and the rebreathing apparatus for the detection of staleness and the classification of fliers, are given study and practical demonstration. The whole course of instruction requires three months of intensive work. The graduates of this school are announced as flight surgeons and assigned to duty at flying fields.

IV. THE FLIGHT SURGEON

The War Department has recently published the following order, showing the duties of flight surgeons and their status in relation to other medical officers at the same station:

"1. Medical officers who have had special training and instruction at the authorized school for flight surgeons and who have been reported after such training and instruction as qualified for the duties of flight surgeons, will, when assigned to such duties by proper authority, be considered as specialists charged with the following duties: The flight surgeon will act as adviser to his commanding officer on all matters pertaining to the physical fitness of the flying personnel; he will make recommendation for the relief from flying duty of officers or enlisted

men who are found physically or mentally unfit for such duty and will make such recommendations as he deems proper, based upon his special knowledge as to the care of the flier, physical exercise, recreation, and periods of rest; he will take sick call for the flying personnel and recommend disposition of the cases excused from flying duty; he will visit such flying personnel as may be sick in the hospital and consult with the attending medical officer regarding their care and treatment; he will make the special physical examinations required for flying personnel by special regulations of the War Department; he will make such special technical reports as may be required by the Air Service and by the Surgeon General. If junior in rank to the surgeon of the post or station he is the assistant to the former, but he should be given freedom of action in all matters pertaining to the physical fitness of the fliers. He will also be given every facility for performing his special duties and for acquiring additional information relative to the medical problems of flying. He should live in as close touch with the flying personnel at his station as is consistent with conditions existing thereat.

"2. The senior officer of the Medical Corps on duty at a post, camp, or station, whether or not he be the flight surgeon, is charged, under the direction of the commanding officer thereof, with all the duties pertaining to the office of 'The Surgeon.' All other officers of the Medical Corps, junior to the surgeon, are his assistants, and regardless of their special qualifications or training stand in a subordinate relation to the surgeon."

CORRECTION OF STATEMENTS IN THE PRESS WITH REFERENCE TO RESERVE OFFICERS' TRAINING CORPS CAMPS¹

Release No. 3, April 18, 1921, subject, ———

"Reserve Officers' Training Corps Camps for the Year 1921" published a list of these camps, to be conducted by the Corps Area Commanders, giving camps by arm of the service, location of the camps, States from which attendance is drawn, and date of opening of the camps.

Articles, based on this release appearing in the Press, erroneously stated that these camps would be conducted for the training of Reserve Officers.

These camps are *not* for Reserve Officers; they are for members of the Reserve Officers' Training Corps. Members of the Reserve Officers' Training Corps are students at the various educational institutions throughout the country, and are *not* Reserve Officers. The Reserve Officers' Training Corps Camps are for the purpose of giving military

¹ Publication of this article was authorized by the War Department on April 23, 1921.

training to these college students as a part of their college course, and to prepare these students for appointment as Reserve Officers.

No training camps are contemplated for the training of Reserve Officers for the year 1921. Their attendance at the Reserve Officers' training Corps Camps and at the Citizens' Training Camps will be in the capacity of instructors only dependent upon appropriation by Congress, not to exceed one hundred Reserve Officers especially fitted for this work will be called to active duty as instructors at these camps.

During the 1921-1922 period, a limited number of National Guard and Reserve Officers will be accommodated at the Army Medical School, Washington, D. C., and the Medical Field Service School, Carlisle Barracks, Pa. Details as to allotments and courses will appear in the next issue of this journal.

MISCELLANEOUS ITEMS ON CITIZENS' MILITARY TRAINING CAMPS

The Surgeon General, speaking in the interests of the Army as a whole, asks the cooperation of every member of the Medical Department, active or inactive, towards making the forthcoming Citizens' Military Training Camp project a success.

Members of the National Guard and Reserve Corps on the inactive list, are requested to bring the objects and advantages of these camps to the attention of all the young men in their communities who might be interested in this movement to the extent of volunteering for the courses offered. The War Department desires that they be given the widest publicity possible.

Wherever physical examinations are not obtained at army stations, free of charge, by the applicant, the War Department is advising the candidate to be examined by a member of the Reserve Corps or by some physician who has had previous military service and is familiar with the details of making a physical examination. In the latter event the expense of the examination must be borne by the applicant.

The Surgeon General is particularly anxious that special attention on the part of officers on the active list be given to the physical side of the candidate's condition while in camp. He desires that the physical examinations held at the camp be thorough and that each youth who presents any defect that appears to be remediable not only be given careful personal advice on the subject, but also if warranted written instructions that he can carry home with him and present to his parents or to his family physician, with a view to having the corrective measures systematically followed out until the desired results have been achieved. The draft statistics clearly disclose that much good can be accomplished along these lines. With so short a stay in camp it is not to be expected

that the desired end can always be accomplished there. Actual demonstration as to the remedial physical exercises, etc., indicated in each case should, however, be given. It will be noted that the physical requirements for admission to the camp are extremely liberal and it is a certainty that at each camp there will be assembled young men meriting the attention of medical and dental officers in this field of endeavor.

Developmental battalions made a name for themselves and played a very important rôle during the World War. In these Citizens' Military Training Camps we are to be confronted with the same physical problems. Upon the closing of each camp the Surgeon General desires that the senior medical officers send to this office, through the Corps Area surgeon, a brief report giving the total number in attendance at the camp, the number in which important deviations from the normal were observed during the physical examinations, the number in which he believes such defects were remediable and in a general way the means employed in imparting instruction to the candidate or the character of written instructions given the candidate as to the proper course to be followed by him in the future; also such other recommendations or observations as the surgeon may see fit to make in this connection. These reports will be helpful to the Surgeon General in preparing recommendations for future camps.

EXTRACTS

(From War Dept. Files.)

"Putting into effect the policy of voluntary military service which forms the basis of our present scheme for National Defense as enacted into law, the War Department plans to conduct Citizens' Military Training Camps throughout the United States during the summer of 1921. Under the provisions of the National Defense Act, as amended by the Reorganization Act of June 4, 1920, it is the primary purpose of these camps to train candidates with a view to their eventual appointment as reserve officers or non-commissioned officers in the Army of the United States.

To comprehend the conception back of the Citizens' Training Camps, it is most essential for one to appreciate fully the fact that the Army of the United States contains three components: viz., the Regular Army, the National Guard, and the Organized Reserves. As at present constituted, these three components rely for personnel entirely upon voluntary military service. In other words, during peace, we must obtain through voluntary military service the training cadre for the vast force that will be called to the colors through universal military service in a major national emergency such as that instanced by the World War.

Providing that Congress appropriates the necessary funds for carrying out the law relative to voluntary military training, Citizens' Military Training Camps this summer will begin not earlier than July 6, nor later than August 10, and will continue for a period of thirty days. Three courses are planned as follows:

Red.—Preliminary and practical military instruction, including carefully supervised physical training and athletics. Candidates satisfactorily completing this course will be eligible for enlistment as privates in the Organized Reserves.

White.—Intermediate military training and instruction with a view to appointment as non-commissioned officers in the Organized Reserves.

Blue.—Advanced instruction and study with a view to commission as a Reserve Officer."

(From Special Regulations 44b, W. D.)

"7. *Classification of Courses.*—Instruction and practical military training are provided by a series of three courses to be known as 'The Red Course,' 'The White Course,' and 'The Blue Course.'

8. *Objects of The Red Course.*—*a.* To bring together young men of all types, both native and foreign born; to develop closer national and social unity; to teach the privileges, duties, and responsibilities of American citizenship; to stimulate the interest of the youth of this country in the importance of military training, as benefit to the individual taking such training, and as an asset vital in the problem of national defense.

(*b*) To show the public by actual example that camp instruction of the kind contemplated will be to the liking of their sons, will develop them physically, mentally and normally; will teach Americanism in its true sense, thus stimulating patriotism and self-discipline, resulting in greater national strength, both civil and military.

(*c*) To qualify young men for service in the reserves.

9. *Qualifications for Admission to The Red Course.*—Physically fit male citizens who have passed their 16th birthday and who are not over 35 years of age. Applicants must have average general intelligence and be of good moral character. No educational qualifications are prescribed or required. Each candidate for admission shall file a certificate from a qualified physician stating that his health and strength are adequate for the course of training; such certificates to be on official blanks to be furnished the applicants; also a certificate from a school-master, clergyman, priest or rabbi, to the effect that the candidate is of good moral character and average general intelligence.

10. *Scope of Instruction for The Red Course.*—Elementary and uniform training and instruction for all candidates which will include the duties of the private in the school of the soldier, squad, and company;

small arms rifle practice; guard duty; camping and marching; individual cooking; care of equipment; personal hygiene; physical development; discipline and morale."

"19. *Physical Examination of Applicants.*—(a) The application blank to be forwarded by a candidate contains a section for recording the results of the required physical examination. Before forwarding the application the candidate must have this physical examination section filled in by an examining physician. The physical examination may be had, free of charge, by applying in person to the nearest army post or station, or army recruiting station. In the event that a civilian candidate does not desire to avail himself of this privilege he may, at his own expense, be examined by any physician, but preferably one who has had military experience. All candidates will be given a thorough physical examination after arrival at the camp.

b. In the case of those civilians who apply for training, the physical requirements will, in general, be those laid down in Special Regulations No. 65*b*, War Department, with the following specific exceptions for students in The Red Course:

1. The tables of physical proportion for height, weight, and chest measurements need not be observed. No candidate weighing less than 100 pounds or who is less than 58 inches in height at the age of 16, 59 inches in height at the age of 17, or 60 inches in height at the age of 18, or over, or who has less than 2 inches chest expansion, will be accepted.

2. Medical examiners may be more lenient in the physical examination than in the case of recruits for the Regular Army, and slight defects (provided that they are not organic and do not impair the mobility of any limb) may be waived. Defects so waived will be noted in the physical examination section.

3. In brief, a suitable candidate is one who is able-bodied and free from disease. He must be able to see well; have good hearing; *his heart must be able to stand the stress of physical exertion*; he must be intelligent enough to understand and execute maneuvers, obey and give commands; and must be able to transport himself by walking as the exigencies of military life may demand. Vision must not fall below 20-100 in one eye and 20-40 in the other eye without glasses, or below 20-100 in each eye without glasses if not correctible with glasses to 20-40 in either eye. Hearing must not fall below 10-20 in either ear. Teeth must be in serviceable condition.

c. All accepted candidates for either The Red Course, The White Course or The Blue Course are recommended and urged to undergo the regular antityphoid-paratyphoid prophylaxis and to be vaccinated against smallpox before arrival at camp. Unless they can present a

doctor's certificate of recent successful vaccination against smallpox and the administration of the antityphoid-paratyphoid vaccine within the last three years, they will be required to take them at camp. Accepted candidates may obtain the vaccination against smallpox and administration of the antityphoid-paratyphoid prophylaxis by applying to the nearest Army surgeon."

"26. *Receiving Candidates*.—The commanding officers of camps will have detailed arrangements perfected for receiving, messing, examining, vaccinating, equipping and assigning candidates authorized to attend the camp. Where camps are located at a distance from railway stations candidates will be furnished transportation. Immediately upon arrival at camp all candidates will be inspected by a medical officer with a view to detecting incipient cases of communicable diseases. This inspection will be conducted with the candidates stripped to the waist."

"29. *Medical Attendance*.—Medical attendance and supplies, including hospitalization when necessary and emergency dental service will be furnished at the expense of the United States to all persons receiving instruction at these camps during the period of their attendance thereat."

"43. *Physical Training*.—Physical training will be given prominence in all camps, both with a view to the physical development of the candidates and to their instruction in physical training methods. A physical training officer of proper qualifications and experience should be designated, who should exercise such supervision as the commanding officers may direct over the following forms of physical training:

- a. Setting-up exercises.
- b. Mass athletics and group games.
- c. Bayonet training.
- d. Boxing and wrestling.
- e. Hand-to-hand combat.
- f. Trench exercises.
- g. Physical efficiency tests.
- h. Organization of free-time athletic competitions and sports.

Care should be taken that the amount and character of physical training prescribed is adapted to the physical condition of all immature and delicate youths and of older persons who have been leading sedentary lives or engaged in indoor occupations."

"45. *Physical Training Objectives*.—The physical training should seek to develop—

- The health and physical efficiency of all candidates.
- Soldierly bearing.
- Mental and physical alertness and concentration of attention.

Strength, speed, endurance, and skill in climbing, vaulting, jumping and running.

Spirit of rivalry regarding physical efficiency of units.

Confidence and aggressiveness in competition because of knowledge of ability to achieve.

Esprit and morale, and to furnish wholesome recreation by sports and athletic competitions.

Disciplinary response.

Spirit of team play and mutual helpfulness."

All applications for admission to Citizens' Military Training Camps should be sent to the Commanding General of the Corps Area in which the applicant resides.

LOCATION OF CAMP

First Corps Area.—Camp Devens, Mass.

Second Corps Area.—Camp Dix, N. J., or Plattsburg, N. Y., or both.

Third Corps Area.—Camp Meade, Md.

Fourth Corps Area.—Camp Jackson, S. C.

Fifth Corps Area.—Camp Knox, Ky., or Camp Sherman, Ohio, or both.

Sixth Corps Area.—Camp Grant, Ill., or Ft. Sheridan, Ill., or both.

Seventh Corps Area.—Fort Snelling, Minn., and Camp Pike, Ark.

Eighth Corps Area.—Fort Logan, Colo., and Camp Travis, Tex., or Camp Stanley, Texas.

Ninth Corps Area.—The Presidio of San Francisco, Calif., and Camp Lewis, Washington.

AN ECHO FROM THE PAST

In view of the wonderful progress made in the treatment of wounds during recent years and of the assurance of success with which surgeons now operate, the following abstract of a report, prepared by the late Col. Alfred C. Girard, M.C., United States Army, will be of interest to those who have followed the development of antiseptic surgery from its earlier stages to the present time:

WAR DEPARTMENT,
SURGEON GENERAL'S OFFICE,
Washington, D. C., August 20, 1877.

Circular Orders;

No. 3.

The following Report, prepared by Assistant Surgeon Alfred C. Girard, U. S. Army, is published for the information of Medical Officers of the Army.

By order of the Surgeon General:

C. H. CRANE,
Assistant Surgeon General, U. S. Army.

Surgeon General, U. S. Army,
Washington, D. C.

General: I have the honor to transmit herewith a report on the materials used in Lister's system of wound treatment and their mode of application.

It is not necessary for my purpose to enter into a discussion on the yet undecided question of the *modus operandi* of the antiseptics, and I may therefore leave to other pens the task of elucidating, from the testimony extant, if the bacteria are the only causes of putrefaction—if there are different species of them, some harmless, some injurious—if they act mechanically or as a poison—if they can cause putrefaction in normal tissues or need a pathological focus for their functions, or simply act as ferment under certain circumstances, or are bearers of a “septic zymoid.” The only thing which concerns us here is the indisputable fact that there *are* germs or ferments in the atmosphere which will produce putrefaction in wounds, and that by preventing their ingress we can in most cases avert the complications which cause the greatest fatality in surgery. This is the key to Lister’s system. For the sake of science it is to be hoped that, sooner or later, more light will be thrown on the physiological and pathological changes connected therewith. This will, however, not necessarily benefit suffering mankind, and we cannot wait for it and shut our eyes to the remarkable clinical results attained by Lister and his followers, because they cannot be explained to everybody’s satisfaction. Be the “germ” theory true or partly true, or an absolute mistake, practically it matters not; for the present it is the best explanation for a most successful method and the best guide in its use.

It would unnecessarily extend the size of this report should I attempt to relate the steps by which Mr. Lister gradually introduced and perfected the system of wound treatment which I am about to describe. He first used it in his hospital in Glasgow in 1868, but ever since it has gradually been changed and improved on by him, and will probably undergo further changes in time. It has met with much indifference and many enemies, but is gradually working its way into all the great hospitals of the civilized world.

During a sojourn abroad last winter my attention was particularly drawn to this innovation in surgery, as it had been introduced on the European continent but two years and was the almost exclusive topic of conversation of the surgical profession there. It happened that my first intercourse was with some of the most decided and renowned opponents of the system, and I became acquainted with all the objections to it before I had witnessed its advantages and benefits. I received therefore the glowing accounts of Lister’s disciples with an incredulous ear, and it was only by traveling from one “Lister hospital” to another that belief in its superiority forced itself upon me. I became convinced that if it is not the only proper wound treatment, it is the safest one, and renders conservative surgery possible beyond what ever had been believed. It would take volumes to describe all I witnessed, and I cite but a few examples. Who, before this, would have fearlessly opened the knee joint for suppurative arthritis, as I saw it done under the “spray,” the patient recovering in a few days with a sound joint? Who would have expected an ovariectomy with general adhesions, in a woman of seventy-five, to heal in eight days without a symptom of reaction; or a laparotomy for the liberation of incarcerated peritoneal hernia, in a moribund patient, healing in six days; or a resection of the ulna in nine days? I observed several hip joint resections recovering in the most favorable manner; numbers of compound fractures of the extremities knitting under Lister’s dressing like simple ones; even comminuted fractures, which formerly would have induced removal of the limb, united without an unfavorable symptom. Cancers which had been removed with great loss of substance united by first intention; other tumors were extirpated and the operation caused no more inconvenience than a simple incision. The smell of putrefaction was banished from wards where scores of patients were lying with grave injuries and severe wounds. Hospitals which had been in use

for centuries, and had become hot-beds of infection; where the majority of operations were formerly followed by pyaemia, gangrene, and erysipelas; where everything had been tried to combat these evils; where treatment "open," "occlusive," by "immersion," compresses of chlorine water, carbolized water, salicylic acid, even Lister's "gauze" and "paste" had failed; became entirely free from these complications as soon as Lister's system with *all* its precautions had been introduced. Professor v. Nussbaum, Surgeon General in the Bavarian Army, told me that formerly he operated in his hospital with the greatest reluctance, as nearly every case was sure to be followed by grave accidents, even the opening of a panaritium or the amputation of a finger would cause pyaemia and death; patients with wounds granulating in the most healthy manner, as soon as brought into his hospital, would become gangrenous and die, when a few days before he appeared on the eve of entire recovery. Now everything is changed. While during sixteen years, in which he had charge of the Munich General Hospital, pyaemia never failed a single month to make its appearance, until at last it seized 80 per cent of the patients, since the introduction of Lister's system it has entirely disappeared. The same is the experience of Professor Volkmann in Halle. These are extreme cases, but they prove the more palpably the advantages of antisepsis. Other hospitals of more recent construction and less infection showed, of course, a lesser rate of improvement, but there, also, the rapidity of recovery and entire absence of complications were sufficiently plain proof to induce the surgeons to carry out the system with all the care observed in infected buildings. It has even found its way into private practice, and is used there also with great success.

It is difficult to adduce statistics in favor of a particular system without going into details which would carry me beyond the scope of the present paper. A few examples might perhaps suffice. While in amputations of the thigh we find a usual percentage of deaths of from 76 to 92, we find in the hospital of Professor Volkmann that six consecutive operations of this kind, and one exarticulation of the hip joint, recovered. Of twenty-seven consecutive amputations, of forty consecutive compound fractures, all recovered. Which other system shows like results? Before introduction of Lister's system, Professor v. Nussbaum performed thirty-four ovariectomies with sixteen deaths (47 per cent); since then he made the same operation sixty-two times and lost only twenty-one patients (34 per cent)—of the last eight none. Lister's percentage of deaths during the two years preceding introduction of his system was 35, during the three succeeding years 15.

My personal investigations and studies were made with German surgeons, some of whom had become familiar with the system under Mr. Lister's personal supervision. Time and other plans prevented my visiting Edinburgh. In fact, I did not have the intention of pursuing this particular line of study abroad until it was forced upon me by the marvelous results I witnessed.

The purpose of this report is to communicate, in the simplest manner possible, the materials used in this mode of wound treatment, their mode of preparation as applicable to our resources in the service, and the technical peculiarities of the dressing.

Lister's system is not the application of peculiar dressings or the use of particular antiseptics. It is a method of treating wounds based on the "germ theory," and its principle aim is to prevent the entrance of germs into wounds, to destroy them if already there, and to guard against the accumulation of wound secretions. In order to attain this end he surrounds the patient with a series of precautionary measures, which from time to time have been improved on by him. These require peculiar materials and appliances, of which I present the latest phase that came under my

observation. They are enumerated without particular plan. Where the mode of of preparation is not indicated, it will suggest itself; where it is described it is adapted as much as possible to self-preparation, thereby facilitating the introduction of the system by diminishing its greatest objection—cost.

1. *Carbolized Solution*.—Used to clean the neighborhood of wounds before operation, to disinfect the hands of surgeon and assistants, and instruments, to wash out septic wounds and clean drainage tubes.

2. *Carbolized Water*.—Used in the spray and to wet the “lost gauze.”

3. *Carbolized Oil*.—To oil catheters and other instruments and fingers preparatory to digital examination. It is also employed when a constant direct contact of the antiseptic with the wound is necessary, as in caries.

4. *Solution of Chloride of Zinc*.—Used to swab out septic wounds.

5. *The Spray*.—In order to prevent the entrance of living germs, during an operation or dressing, a spray of “carbolized water” is directed on the wound. The best instrument for the purpose is “Lister’s spray,” a steam atomizer which throws a large cone of finely divided spray.

6. *The protective* is oiled silk, coated with copal varnish, to render it impermeable, and then covered with a thin layer of 1 part dextrine, 2 parts starch, and 16 parts “carbolized solution,” to facilitate adhesion of the disinfecting fluids into which it is dipped before being applied to the wound. The purpose of the “protective” is to prevent the irritating effect of the contact of the antiseptic with the wound. It is placed immediately over this, overlapping it but little.

7. *The Antiseptic Gauze*.—A peculiar unstarched cotton gauze, selected by Mr. Lister on account of the facility with which secretions penetrate its meshes. It is prepared with antiseptics (carbolic acid), and thus, after absorbing the wound fluids, it prevents their decomposition.

8. *The McIntosh*, common rubber cloth, is used to keep the secretions of the wound from finding their way immediately to the surface, and to compel them to permeate the whole dressing, thus being constantly in contact with the carbolic acid. It is cut an inch smaller than the gauze, that the secretions when about to appear externally may be discovered while yet lying in antiseptic material. The “McIntosh” need not be renewed with the dressing, but may be washed off with carbolized water and used again.

9. *Catgut* is the *sine qua non* of Lister’s dressings for ligatures and deep sutures. In a few days it is absorbed and the wounds close over it without danger of its acting as an irritant or permitting hemorrhage.

10. *Salicylic Cotton*.—Mr. Lister has of late used this to bolster up and fill inequalities of the surface. The salicylic acid not being volatile, and cotton being easily impregnated by it, it forms a useful supplement to the gauze.

11. *Sponges*.—All sponges used in connection with Lister’s dressing, in the cleansing of wounds and absorption of wound secretions, should be prepared in the following manner: After being carefully beaten, cleaned, and washed out in lukewarm distilled water, they are immersed in the “carbolized solution” and kept there until needed. After use they are washed out in the solution and replaced in the vessel. In this manner they can be used over and over again as long as they last. In addition to the usual small dressing sponges some larger ones are to be kept on hand. They are applied to wounds the first day after the operation to absorb the more copious secretion caused by the spray.

12. *Drainage-tubes* are small flexible rubber tubes of the size of a small quill to that of a little finger, with numerous openings on the sides, each of half the diameter

of the tube. Their use is to facilitate the egress of wound secretions without interfering with union.

13. *Antiseptic Silk*.—The catgut is only used in ligatures and deep sutures. For superficial sutures it does not retain its firmness long enough and silk is preferred in its stead. This is rendered antiseptic by being steeped for an hour in a hot mixture of beeswax 10, cryst. carbolic acid 1, and then drawn through a cloth to remove the surplus wax. It is then preserved in a closed vial. In this manner it combines the advantages of the wire with the suppleness of the silk. Septic germs cannot penetrate in the interstices of the fiber, and the wax, besides increasing the hold of the knot, retains sufficient amount of the antiseptic to destroy any germs which might enter the suture.

In order to complete the list of dressings pertaining to Lister's system, I must add the preparations of boracic acid, which is claimed to be an antiseptic milder than carbolic acid but holding its properties longer.

1. *Boracic Water*.—Three per cent solution of boracic acid in water. The water is mainly used to moisten the boracic lint, where this is used.

2. *Boracic lint* is prepared like salicylic cotton. It takes the place of carbolized dressings, where these cannot be closely adapted to the skin, as in resection of the lower jaw and in hare-lip sutures.

3. *Boracic Ointment*.—This is spread on thin cotton and applied to ulcers and granulating surfaces. It is neatly fastened to the skin by painting the surface over with collodion.

In applying Lister's dressings it must be borne in mind that they promise complete success only in operations where the prescribed precautions for the destruction of germs, or prevention of their entry into the wound, have been conscientiously observed. Even the most careful disinfection of wounds which have been exposed unprotected will not always be successful, as germs may have penetrated beyond the reach of the antiseptic. Still even there the probabilities are in favor of antiseptics, and the facility of evacuation of pus by the drainage tubes, and its disinfection in the meshes of the gauze, which also prevents the entrance of new living germs, predisposes most wounds to rapid healing. We must at all times be thoroughly alive to the fact that the entrance of one living germ may destroy the usefulness and render an operation, which otherwise would barely affect a patient's health, the starting point of erysipelas, gangrene, or pyemia. These germs may be introduced by the surgeon's finger, by the instruments, by the very dressings, if any one of Lister's minute directions is neglected. On the other hand, it is the easiest mode of operating and dressing; the rules are so positive that surgery loses its speculation and a quick recovery can almost with certainty be looked for.

Whenever elevation of temperature, rapidity of pulse, erysipelas, swelling, diffuse cellulitis, symptoms of pyemia, follow an operation, we may be sure, in nine cases out of ten, that some fault has been committed—either the discharge has appeared on the surface and been allowed to become septic, or the drainage tube is closed, or not properly trimmed, or not introduced to the proper point.

The following articles, as a rule, should be at hand before proceeding to an operation: Towels; soap and sponge with warm water; nail brush and ether; two bottles carbolized water; two atomizers, filled, the second in case the first should fail; basin, with necessary small sponges, and one or two large ones, soaking in carbolized solution; bottle with chloride of zinc solution; basin with carbolized solution, to disinfect the hands of surgeon and assistants—the instruments and a piece of gauze should

also be kept in this basin; vessel with catgut; vessel with drainage tubes; bottle with antiseptic silk; and the necessary gauze and McIntosh.

First, all the hair in the vicinity of the place to be operated on must be carefully shaved off. The skin is then to be cleaned with soap, water, and a nail brush, and after that with ether to remove fatty matter and detritus. The patient is then etherized.

As soon as the patient is thoroughly anesthetized the spray is set in operation. . . . A final washing with carbolized solution is now given to the skin, and the spray is made to play on the wound, taking care not to allow the hand of the operator to intervene. The instruments are taken from the basin as needed and returned to it as soon as used. The blood is cleared away by the antiseptic sponges.

Should, at any time during the operation, the spray cease to work, then the piece of gauze which lays ready in the carbolized water is to be thrown quickly over the wound and kept there until the spray is again in proper condition.

The operation being completed, the tourniquet is removed. We may always expect copious parenchymatous bleeding, partly owing to reaction after the elastic bandage, partly because the spray prevents, in a measure, the formation of clots. Arteries which have been overlooked during the previous ligation must now be secured, the rest of the bleeding can easily be stayed by compression or application of cold. The wound is then carefully washed out with carbolized water; no union of the edges is to be attempted until all hemorrhage has ceased. The drainage tubes are then to be introduced and the superficial sutures applied with antiseptic silk. The personal tact of the operator will show him where and how many drainage tubes are necessary to facilitate the egress of the discharge. They should in all cases be first dipped in carbolized solution.

The wound is then covered with the protective, dipped in carbolized water, and over this the lost gauze, that part of the gauze which is applied wet. Now the spray may be suspended, and the remainder of the gauze is applied.

Here I must digress to show the mode of dressing wounds which were not made under the spray; after this the dressing is alike in all cases. In fresh wounds it is mostly sufficient to wash them out thoroughly with the carbolized solution. This must be done even in wounds of joints. Where suppuration has already commenced, there the carbolic acid is not sufficient to enforce asepsis. In these cases Lister uses the solution of chloride of zinc, with which the wound is carefully swabbed out. It should be forced into every recess by the pressure of the fingers. Still such cases are always doubtful, and if they do not result favorably the dressing is not always to blame, as the germs may have penetrated beyond the reach of the antiseptics.

We now proceed to the final dressing. A large antiseptic sponge is laid over the protective, and over it the *lost gauze* and the eight layers of gauze, the whole retained in place with broad gauze bandages, cut from the same material. They adapt themselves better than ordinary bandages, do not slip as easily, and have, also, antiseptic properties. A gentle, but firm, compression by them will facilitate the agglutination of the wound surfaces and the egress of the discharge. The turns, especially where they are apt to be displaced, must be secured by small safety-pins. Inequalities of the surface, where the gauze does not closely adhere to the skin, must be filled with salicylic cotton, as such places are favorite passages for the wound secretions.

The first dressing should be removed, at the latest, in twenty-four hours, sooner if the discharges appear anywhere on its surface. The changes are made under

spray, which is carefully directed towards the wound, while pins, roller, gauze, sponge, and protective are successively taken off. The protective will be found to have retained its natural color, if the wound is aseptic. Where decomposition is going on, it shows dark, brownish spots, caused by the action of the lacerated sulphur in the pus upon the lead of the oiled silk. In this manner it is a delicate test of the success of the antiseptics. Whenever the protective is discolored, the wound must be treated like a septic wound, either with carbolyzed solution or the chloride of zinc. The spray is to cease as soon as the lost gauze covers again the protective. The changes have to be daily ones as long as the secretions are plentiful. The wound should be interfered with as little as possible—the surroundings being gently cleaned with salicylic cotton or a sponge. If, as usually happens, the surface of the wound closes *per primam*, then two or three dressings will be sufficient. Besides the feelings of comfort or discomfort of the patient, and the staining of the dressing, we find the best indicator as to the necessity of changes in the temperature of the patient's body. Where this is normal, and the bandage unsoiled, we can pass on—everything is right. When the patient's temperature slate shows an increase over the preceding observation, it will be an absolute indication to remove the dressings and examine the wound. In almost every instance we will find an accumulation of pus, which had not been reached by the drainage, or the tubes are choked, or some slight neglect has permitted some septic changes as shown by the spotted appearance of the protective. A longer drainage tube, a counter opening with a new tube, syringing with carbolic solution, will remedy the evil, and the temperature falls. The precaution must not be relaxed until the cicatrix is fully formed; a single unprotected granulation has given rise to violent erysipelas.

In conclusion of my remarks on the precautions necessary in the application of the dressings, I wish to state that the paraphernalia of the system are not as intricate and formidable as they appear on paper. In a few days they will become second nature, not only to the surgeon, but to the nurses, even the patient; the latter will not fail to call attention to the appearance of the stain, and the nurses will no more handle a dressing forceps without first dipping it in the antiseptic.

I am, General, very respectfully,

Your obedient servant,

A. C. GIRARD,

Captain and Assistant Surgeon, U. S. A.

Fort Randall, D. T.

Abstracted by F. M. MUNSON.

GENERAL GORGAS

General William Crawford Gorgas died in London on July 4, Sanitary Director of the Army of the United States in the Great War, an event which should be recorded in a journal which dealt with medicine in the Colonies. He entered the Army in 1880; became a Captain in 1885; was promoted Major during the Spanish War and when that closed was made Director of Sanitation at Havana. A man of great constructive energy, he had convinced himself that the recent investigations of yellow fever made by Reed and others deserved to be pushed to their logical conclusions, and he saw they were. He isolated the sick in houses with complete wire gauze screening, and protected all water surfaces by covering or oiling them. As the *steyomyia calopoes* was a town mosquito, he succeeded admirably, and in three months relieved Havana from a plague which had pestered it for two hundred years. He fought other epidemic diseases with the same energy and cleaned the town

thoroughly, not only the streets but the yards of the rich, and so reduced its mortality to the level of that in North American towns before he left in 1902. He was promoted to Colonel by Special Act of Congress.

In 1904 he went as Sanitary Director to Panama, which in 1880, when the French tried to cut the canal, had been one of the most pestilential places in the world, when they lost 22,189 people in nine years, and so had their efforts brought to destruction. In less than a year Gorgas had eradicated yellow fever. He also victoriously fought against malarial fever. He had 1,200 men working under him, who sought out the breeding places of anopheles, men draining or oiling waters, men putting up mosquito screens, lecturers and visitors with quinine. Done on such a scale his results were not only magnificent but immediate. Malaria was not indeed completely done away, but only $8\frac{1}{2}$ per cent cases occurred in a year, all infective diseases were besides reduced to a minimum and the sickness of women and children was reduced to the level obtained in cities of the Temperate Zone. Then Gorgas could boast he had proved, what others like Sambon and Rho had asserted, that with good hygiene the white race could work hard in the tropics and yet live and prosper. In 1913 he was called by the Government of South Africa to deal with pneumonia among mine workers, which he did by suggesting merely a larger cubic space in the sleeping rooms which notably reduced the cases and their fatality.

In 1914 he was promoted General and became head of the North American Army, which post he held till 1918 when he retired.

The English appreciated him as much as his own people: In 1914 he was made an honorary D.Sc. of the University of Oxford, and when he was sick in London, King George himself came to see him and give him a distinguished honor, and when he died there was a crowded memorial service for him in St. Paul's Cathedral.

Rarely were such tributes from people and King so deserved.

The above is an abstract made from an article signed by General F. Rho, formerly Director General of the Italian Naval Medical Department, and published in the *Annali de Medicina Navale e Coloniale*, the journal of the Medical Department of the Italian Navy.

A CHANGE OF NAME

With the May issue the name of *Modern Medicine* will be changed to the *Nation's Health*. This is being done to make the title more clearly descriptive of the present scope and the new and greatly enlarged service of the magazine in health promotion and conservation.

The change is one which has been under consideration for some time. It is the final step in the development of a magazine which we confidently expect will be of distinctive service to those who are in positions of responsibility for the Nation's greatest asset, the health of its citizens.

The change of name and the broadening of its field of endeavor complete the transformation of the *Interstate Medical Journal*, the predecessor of *Modern Medicine*, from a publication devoted to clinical medicine to a health magazine of broad national service—a magazine devoted to community, industrial, and institutional health problems.

The *Nation's Health* will continue those features which have proved

most interesting and serviceable to the readers of *Modern Medicine*, but will cover the subjects treated more completely, and, in addition, inaugurate other features which are important in the new and wider field.

SURGEON GENERAL CUMMING ON THE TYPHUS SITUATION

In view of the extraordinary publicity given the typhus situation at the port of New York and the erroneous impression created by some of the representations, the following statement of the facts has been made by Surgeon General Cumming, of the U. S. Public Health Service:

"The menace to this country from the introduction of typhus from Europe is not of recent development and is no greater today than it was six months ago. Even before the Armistice the Surgeon General recognized the potentialities of the disease spreading to the United States if adequate precautionary measures were not taken when immigration was resumed. During the past year medical officers of the Public Health Service have been stationed at American Consulates at chief European ports of embarkation to supervise measures to be applied against ships and passengers for the prevention of the spread not only of typhus but also of plague and cholera. While the measures enforced at the European ports have by no means been perfect, their value is indicated in the fact that several hundred thousand immigrants have come from typhus-infected areas on several hundred ships and that out of all this number typhus infection occurred only on eight vessels. With the exception of the *S.S. Presidente Wilson*, which arrived at New York on February 1, infection on the ships was detected by the quarantine officer at New York and effective precautionary measures applied. Upon arrival of the *S.S. Presidente Wilson* at New York there were three cases in the sick bay of what the quarantine officer diagnosed as broncho-pneumonia but which later on proved to be typhus. The doctor was experienced in the detection of typhus, but the cases presented no eruption and the mistake was by no means inexcusable. Still under the custodial care of the immigration authorities the sick people were sent to the Long Island College hospital, which takes care of sick immigrants, and the correct diagnosis later became apparent. Fortunately the error was discovered before the other passengers in the steerage were released, and the vessel and the immigrants were remanded to quarantine and appropriate treatment applied to prevent the spread of the infection. The incident was unquestionably deplorable, but it indicated neither a breakdown of the New York quarantine station nor any unreasonable laxity.

The system of quarantine protection developed by the Public Health Service consists of a double line of defense, first the medical officers at foreign ports who supervise preventive measures specified in the United States Quarantine Regulations, and, second, the facilities at United States quarantine stations. If infection evades the first barrier, the ship still has to undergo inspection and treatment at her American port of arrival.

Several weeks before the arrival of the *S.S. Presidente Wilson* the Surgeon General had taken very definite steps to strengthen the quarantine defense at European ports by having American consular officials instructed, through the State Department, to withhold bills of health from vessels whose passengers had not been satisfactorily disinfected. As early as January 17 quarantine officers at Atlantic ports were advised that on account of the unsatisfactory delousing procedure carried out at Danzig all passengers arriving at their ports should be held in quarantine and treated for the

destruction of vermin. It must, therefore, be evident to any fair-minded person that the Federal health authorities have been most diligent in carrying out anti-typhus measures, and that any statement that either the Federal Health Service or the State officials of New York have been derelict or indifferent to the typhus situation is obviously untrue. Nevertheless administrative efforts of this sort cannot be expected to be perfect or to eliminate mistakes by individual officials.

Typhus is not transmitted by lice in general but only by lice that have previously bitten persons infected with typhus. A louse is by no means an exotic insect, as one might infer by some of the interviews in New York papers. It is widespread throughout the United States, but is found chiefly in the slum districts of large cities. In the absence of typhus it is of no sanitary significance or danger so far as the present situation is concerned. Typhus fever develops in four to twelve days, and it is readily apparent to any trained sanitarian that if cases do not develop within this period it can safely be asserted that the infection is not present. This applies particularly to overseas vessels that have been out twelve days or more.

Much confusion has resulted from the statements in newspaper interviews in New York City as to responsibility of the Immigration Service at Ellis Island for the exclusion of typhus fever. Immigration officials are not vested with any authority administering quarantine laws. Furthermore, they have no equipment for enforcing quarantine measures—naturally so because they have control over aliens and not over citizens of the United States, although the latter returning from Europe are just as serious a menace from the typhus standpoint as is an alien. It is true that Ellis Island has always proved a valuable line of second defense for the port, but the responsibility for the exclusion of typhus and other quarantinable diseases rests solely upon the quarantine authorities. As a matter of ordinary decency and personal hygiene delousing facilities should be provided at Ellis Island, but since the prevention of the introduction of typhus relates to returning citizens as well as aliens, the quarantine station is the one place where effective preventive measures can be carried out.

As to the statement that "one infected immigrant might spread a plague that would cause a million deaths in six weeks in New York" it is interesting to note that, while not generally known, typhus fever has existed in New York City for years. About 1910 Dr. Nathan Brill recorded a series of somewhat less than 200 cases which he had observed in the previous ten years, and during 1911 thirty-four such cases occurred in New York City, and others have occurred from time to time since that date. For the most part they were of isolated occurrence and indicated that conditions in New York City were not conducive to any serious spread of the infection. Goldberger and Anderson of the U. S. Public Health Service, in 1911, demonstrated by laboratory tests that the so-called "Brill's disease" was identical with old-world typhus; that the clinical manifestations were very similar but much milder in type, that the disease was transmitted by the louse in the same way as old-world typhus, and while not so virulent, sometimes resulted fatally.

THE TRUE SITUATION AT U. S. PUBLIC HEALTH SERVICE HOSPITAL NO. 61, FOX HILLS, S. I.

We, the undersigned, physicians of the consulting staff attached to the U. S. Public Health Service Hospital No. 61 at Fox Hills, S. I., have observed with regret that some of the New York newspapers have printed persistent and unjust attacks on the administration and resident medical

staff, and particularly on Dr. J. O. Cobb, the medical director. On our personal visits to the hospital, and on interrogating the patients of Fox Hills Hospital, we have not heard one complaint justifying such statements as lack of surgical or medical attention, insufficient or bad food, cruel or harsh treatment on the part of orderlies, guards, nurses, or physicians. The sanitary conditions are such as are found in all well-equipped and well-managed hospitals.

In regard to the present condition of the Hospital, the following facts must be borne in mind:

1. Fox Hills was constructed in ninety days by the Army as an evacuation hospital.
2. The Army retained this hospital until October 15, 1920.
3. As the Army intended to give up the hospital at an early date no attempt was made to put the place in a general state of repair.
4. We wish it however clearly understood that statement "3" is in no way a reflection or criticism upon the Army.
5. There were about 3,000 panes of glass broken when the U. S. Public Health Service took possession of the hospital.
6. It has cost close unto \$5,000 merely to replace the broken beaver board in the walls and ceilings.
7. The heating plant was in very bad condition.
8. No inside painting had been done by the Army.
9. The Public Health Service had no alternative but to take Fox Hills for the reason that there was no other available hospital space in the Metropolitan zone.
10. Being compelled to take Fox Hills as stated above, the present hospital administration has nearly completed the painting of the corridors, some of the wards, part of the officers' quarters, part of the nurses' homes, one Red Cross house, library, etc. In another month the inside painting will be completed at a cost of about \$40,000.
11. As soon as the weather permits it is intended to paint the outside of the buildings at an estimated cost of \$150,000. There has been spent considerably over \$100,000 in general repairs, supplies, etc.
12. The general expenses for salaries, food, etc., run about \$140,000 a month. The heating of the plant cost the Army \$127,000 last year.
13. This plant was taken as an emergency hospital pending the construction of a permanent hospital in the Metropolitan zone. Congress has just appropriated about \$4,000,000 for a large hospital in the Metropolitan zone. Fox Hills, of course, was never intended for any other purpose than to take care of the situation pending this construction.
14. In reference to the published complaint about an insufficient staff of nurses and doctors, we would wish to say that there has never been a time since the hospital has become a part of the U. S. Public Health Service, which was on October 15, 1920, that a ward was without the supervision of a trained nurse, regardless of the great and unexpected influx of patients. Whenever there were seriously ill patients nurses were detailed to take care of them. In the wards where convalescent patients predominated a nurse supervised and the principal part of the work was done by hospital corps men. There is a shortage of nurses all over the United States, not only in Army, Navy, and Public Health Service hospitals, but in civilian hospitals as well. The nurses at Fox Hills are well paid, receiving \$80 to \$85 per month, including

board, laundry, etc., and those in the service are satisfied and contented. There are always forty to forty-five resident physicians in attendance.

15. In view of the fact that ex-service men are no longer under military discipline, it is inevitable that among 1,200 men there will occasionally be disturbance caused by men coming in late, staying out beyond the hour of permission given, and even once in a while coming in intoxicated. Such matters are usually satisfactorily settled by the morale officer. The statement published in one of the New York dailies that Dr. Cobb had said the patients at Fox Hills are drunkards, thieves, and dope fiends, is false.

16. It is true that, owing to lack of hospital facilities, Fox Hills Hospital is compelled to treat the so-called shellshock and other nervous cases at this hospital. The consultants think these cases are well cared for where so much is done by the Red Cross and other activities to divert their minds from their troubles. The Red Cross and other activities at this hospital could not be carried on more effectively than at the present time. Compensation of the men is being looked after from a number of sources. The American Legion itself keeps in touch with this question. There is no man needing clothing who is not attended to by the Red Cross and the American Legion.

17. All venereal cases are kept strictly isolated and their food and dishes are kept entirely separate from other patients' of the hospital.

18. Lastly, complaints have been made about the unsatisfactory climate for the tuberculous patients at Fox Hills. Although, according to modern conceptions, climate is considered of secondary importance in the treatment of tuberculosis, it must be stated that this hospital was never intended for tuberculous patients. Many have come there by their own requests from other hospitals so as to be nearer their homes in either New York or New Jersey. Others have been sent there for observation, to determine their condition, being only suspected cases of tuberculosis. Any case able to travel can be sent to Oteen, N. C., if he so desires. Patients are kept informed of this fact. A few cases are transferred from time to time to the Government Hospital at New Haven, Conn., whenever there are vacant beds. A large number of tuberculous patients arrive at the hospital in the last stages of the disease, which accounts for the relatively large mortality.

It is our desire that the foregoing facts giving the real situation at Fox Hills should have as wide a publicity as possible, so that the truth may become known by the relatives of the patients, the American Legion, and the American public at large.

ROBERT KINGMAN, M.D.
S. ADOLPHUS KNOPF, M.D.
ALEXANDER LAMBERT, M.D.
ARTHUR MCGUGAN, M.D.

New York, March 29, 1921.

BOOK REVIEWS

EPIDEMIC RESPIRATORY DISEASE. By Eugene L. Opie, M.D., Francis G. Blake, M.D., James C. Small, M.D., and Thomas M. Rivers, M.D., Illustrated. St. Louis: C. V. Mosby Company, 1921. pp. 1-402. Price, \$6.50.

This book is really the report of a commission of medical officers, composed of the authors, appointed by the Surgeon General of the Army, to study the pneumonias prevalent in the army camps in 1918. The work recorded in the book was done at Camp Funston, Kansas, and Camp Pike, Ark., and the conclusions arrived at as the result of the work are most valuable and of great importance in the prophylaxis of respiratory disease.

The work is divided into seven chapters and an appendix. The first chapter by Blake, Rivers, and Small is upon the etiology of influenza, in which they conclude that *B. influenzae* is probably the specific etiological agent in epidemic influenza. The second chapter, by Blake and Rivers, treats of the clinical features and bacteriology of influenza and its associated purulent bronchitis and pneumonia, and is an excellent consideration of the subject. The third chapter, by Opie, Blake, Small, and Rivers, discusses secondary infections in the ward treatment of influenza and pneumonia and contains much suggestive and valuable material. They conclude that secondary contact infection with pneumonia not infrequently occurs in patients with pneumonia following influenza when they are treated in pneumonia wards, as does secondary infection with *S. hemolyticus*, and that the ward treatment of these diseases is always accompanied by serious danger and can only be effectively guarded against "by individual isolation and strict quarantine of every patient."

The pathology and bacteriology of pneumonia following influenza is considered by Opie, Blake, and Rivers, in chapter four of the work, and is a most valuable contribution to our knowledge of the subject. The chapter is beautifully illustrated with half-tones showing the gross and microscopical pathology of the various types of pneumonia studied, and the text covers nearly two hundred pages of the book. The fifth chapter of the work treats of secondary infections in the ward treatment of measles, and is written by Small. He concludes that "the epidemic dissemination of hemolytic streptococci occurs in measles wards, and is a serious danger," and that "methods to prevent transfer of infection within the ward and separation of 'carriers' from 'non-carriers' in different wards are efficient in keeping epidemic dissemination of hemolytic streptococci under control," but that "the dissemination of *B. influenzae* in patients with measles was not controlled by segregation of 'carriers' and 'non-carriers' of this organism as identified by throat cultures in different wards."

The sixth chapter of the book is devoted to a consideration of the pathology and bacteriology of pneumonia following measles, and is by Opie, Blake, Small, and Rivers, and the seventh chapter, by all the authors, is a résumé of their findings and conclusions. They urge the isolation of each patient suffering from pneumonia as the only effective means of protecting others from infection and the patient himself from infection with pneumococci of a different type from the one concerned in the production of the disease from which he may be suffering. They also state that "When streptococcus pneumonia has appeared in a ward it should be closed to further admissions."

This book is one that will well repay careful study by every epidemiologist and public health officer. While all may not agree with many of the conclusions of the

writers it is undoubtedly one of the best presentations of the subject that has appeared to date. It is well printed on a superior grade of paper and the illustrations are excellent.

CHAS. F. CRAIG.

THE PRINCIPLES OF IMMUNOLOGY, by Howard T. Karsner, M.D., and Enrique E. Ecker, Ph.D. Illustrated. J. B. Lippincott Company: New York and Philadelphia, 1921. pp. 1-310.

This book, according to the authors, is designed especially for students of medicine and for practitioners whose duties render it impossible for them to consult the large mass of material that is now published regarding resistance and immunity. The book, therefore, is largely devoted to the discussion of the fundamental facts regarding immunology, and the authors are to be congratulated upon the success that has attended their efforts to present to the medical profession all that is of fundamental importance in this branch of medicine which has developed into the most important, from the standpoint of laboratory diagnosis, of the more truly scientific branches of our art.

The authors consider, in an adequate manner, the virulence of organisms, general conditions of infection and immunity, the general phenomena of immunity, toxins and antitoxins, agglutins and precipitins, cytotoxins, cellular resistance, complement fixation, the application of complement fixation to the diagnosis of disease, hypersusceptibility, and the defensive ferments. There is also an appendix in which the therapeutic employment of blood serum, prophylactic vaccination, and vaccine therapy are treated.

In their consideration of the subjects mentioned the authors record all of the really important results obtained by different investigators and the conclusions that appear to be justified from them. The book is marked by its conservative tone and the authors' own deductions and conclusions are modestly given and credit acknowledged to others who have either agreed or disagreed with their own conclusions. Technical methods are introduced wherever they are necessary to make plain the text but the work is not one devoted to technique and therefore only the most important technical methods are given in detail.

There is very little to criticise in this really excellent work. More space might have been given to the subject of complement fixation in tuberculosis to advantage but the facts stated in the consideration of the subject are those warranted by practical experience and much more fair to this really important method of diagnosis than those given in most works upon immunity. The authors discuss fully the wonderful results obtained in our army during the late war with prophylactic vaccination against typhoid, and state that "the results (of prophylactic vaccination in typhoid) obtained in all civilized countries constitutes one of the greatest achievements resulting from the study of immunology."

The book is well printed on excellent paper and can be recommended as a thoroughly reliable and up-to-date treatise upon immunology. It should prove of the utmost service to both the student of medicine and the general practitioner.

CHAS. F. CRAIG

ESSENTIALS OF TROPICAL MEDICINE, by Walter E. Masters, M.D., M.R.C.S., L.R.C.P. Lond. New York: William Wood and Company, 1920. pp. 1-702. Price, \$11.00.

In the preface to this work the author says: "This work contains nothing new. It is not intended to substitute any other book. It is a digest of our knowledge of

Tropical Medicine, including Skin Diseases, Venoms, Eye Diseases, Hygiene, and Laboratory Hints, in a form handy for ready reference: the vade-mecum of the student and busy tropical practitioner."

The reviewer regrets that he cannot subscribe to the above statement, for a careful perusal of this book will convince anyone that it is a very poor guide to either the student or practitioner in the tropics, as it is filled with inaccurate statements and the valuable material that it does contain is so arranged and confused with immaterial statements and inaccuracies that it is practically lost so far as ready reference is concerned. Almost every section of the work is unsatisfactory, shows hasty preparation, and lack of intelligent reading of modern literature upon the subjects treated, but the sections upon Diseases due to Protozoa, Diseases due to Helminths, and Laboratory Hints are especially full of misstatements and will certainly lead anyone astray who reads them unless he is acquainted with the subjects treated.

As instances of the inaccuracies with which these sections abound the following may be cited: The author describes parthenogenesis in malaria as follows: "The female gametocyte can resist drugs in the body and lie dormant until taken up by a blood-sucking insect, when the nucleus and protoplasm will divide, one portion disappearing, while the other forms merozoites, and starts the cycle of schizogony again." A more inaccurate description of this process can hardly be conceived. Again, the author speaks of *S. icterohaemorrhagica*, *S. icterohaemorrhagicae*; calls the pathogenic entamoeba of man, *Entamoeba tetragena*; states that it reproduces by binary division, gemmation, and spore formation, and that "*A. minuta* lives on the surface of the mucous membrane, but is capable of maintaining the infection." The author also states that "It is not important in practice to diagnose *A. tetragena* from *A. coli*, if one employs the rule that if the symptoms of dysentery are present and amoebae are seen in the stools treat as for amoebic dysentery." More pernicious advice than this is hardly possible when one remembers that *Entamoeba coli*, the harmless amoeba, is present in the majority of cases of bacillary dysentery. The author states that the causative agent of framboesia is "a spirillum, the *Treponema pertenue*"; that amoebic dysentery is caused by *Entamoeba tetragena*, and that "Men, dogs and cats act as carriers without obvious symptoms, and should be treated *pro bono publico*"; and that the limit of the normal flight of mosquitoes is less than half a mile. The above are only a few of the very numerous gross errors in which the book abounds and which render it a dangerous guide to the student or physician.

The literary style is most peculiar, the subject matter being stated in declarative sentences throughout the entire book of more than seven hundred pages. In fact, the book appears to be a reproduction of a student's notebook rather than a real treatise upon tropical medicine. It is always a disagreeable task to criticise a work of this character but the reviewer feels it his duty to the medical profession to state that this work is not a reliable guide to either the student or the practitioner in the tropics. It is most unfortunate that it was published in its present form and it will require the most careful revision before it can fulfill the purpose for which it was intended.

CHAS. F. CRAIG.

GONOCOCCAL INFECTION IN THE MALE. For Students and Practitioners. By Norman Lumb, O.B.E., M.B., B.S., (Lond.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), Author of "The Urethroscope in the Diagnosis and Treatment of Urethritis." "Systematic Treatment of Gonorrhoeas"; Late Captain R.A.M.C. (T.C.), Specialist in Venereal Diseases and Officer-in-Charge of Division, General Hospitals, B.E.F.; Clinical Assistant, St. Peter's Hospital for Stone. Illustrated with

165 Figures and 13 Three-colored Plates. New York, William Wood & Co. 1921. Price \$6.00.

This is a complete, thorough, authoritative, and practical treatise on this important subject. It is divided into twenty chapters each devoted to a separate phase of the topic, such as pathology, symptoms, treatment—including vaccine treatment, chemo-therapeutic treatment, electro-chemical treatment, complications, and a very full dissertation on the urethroscopic examination of the normal and pathological urethra. The illustrations and plates are excellent. Whenever possible, instruments are shown in actual use in preference to reproductions from the maker's lists, thus reducing the necessary description to a minimum.

FRANCIS M. MUNSON.

THE MEDICAL EXAMINATION OF AIRMEN. A Practical Guide for use in the Examination of Members of the Air Service and its Recruits, by Doctor Maublanc and Doctor Ratié, of the Châtres School of Flying. With a Preface by Professor André Broca, and an Introduction to English Readers by Wing-Commander Martin Flack, C.B.E., M.A., M.B. Translated from the French by Norman Ball, M.R.C.S., L.R.C.P., late R.A.M.C. Published by William Wood & Co., New York, 1920. Price \$1.50.

This small volume of eighty-eight pages will be welcomed by medical officers and others of the medical profession who are called upon to make the physical examination for flying. Many fatal airplane crashes have resulted because of physically defective pilots, and it is quite evident to all who have given the subject consideration that a thorough physical examination must be required of all pilots. A very high physical standard is now required of our Army pilots by War Department regulations. This or a similar standard must eventually be adopted for all civilian pilots through the enactment of proper laws, in order that communities as well as passengers and the pilots themselves may be protected from accidents due to physically incompetent pilots. This subject will, therefore, become more and more important as aviation develops. The authors have had extensive opportunities for studying large numbers of airmen, and the methods employed by them in France as well as their conclusions will be interesting and valuable to all medical men in this country who are called upon to make the physical examination for flying.

ALBERT E. TRUBY.

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